APPLICATION TO THE

HIGHER EDUCATION COORDINATING BOARD
FOR

BACHELOR OF APPLIED SCIENCE
IN
RADIATION AND IMAGING SCIENCES

BELLEVUE COMMUNITY COLLEGE
MAY 03, 2006

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FORM 2

COVER SHEET - NEW DEGREE PROGRAM PROPOSAL

Part I requires the completion of the following forms: Appendices B-4, B-5, and B-6.

Program Information

Program Name: Radiation and Imaging Sciences

Institution Name: Bellevue Community College

Degree Granting Unit: Bellevue Community College

Degree: B.A.S. Level: Bachelor Type: Applied Science

Major: Radiation and Imaging Sciences CIP Code: 51.0999

Concentration(s): 1) Radiation and Imaging Management
2) Advanced Radiation and Imaging Technology

Proposed Start Date: Fall 2007

Projected Enrollment (FTE) in Year 1: 20 FTE; At Full Enrollment by Year 2: 40 FTE

Proposed New Funding: $226,000 one time only funding for start up costs (planning year); thereafter, $6,300/ FTE state funding and $4,100/ FTE tuition. Total annual state funding at full enrollment - $416,000. Application fees - $12,500 per year. Self funding: Year 1 - $164,870; Year 2 - $9,512; Year 3 - $15,505.

Funding Source: ☑ State FTE ☑Self Support ☑ Other

Mode of Delivery

☑ Single Campus Delivery Bellevue Community College – Main Campus
☑ Distance Learning On-line and blended or hybrid formats
☐ Other

Scheduling

☐ Day Classes ☑ Evening Classes ☑ Weekend Classes
☐ Other *(describe)*

Attendance Options

☑ Full-Time
☑ Part-Time
Total Credits: 90 ☑ Quarter ☐ Semester

Contact Information (Academic Department Representative)

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Ronald Leatherbarrow

Endorsement by Chief Academic Officer

May 2, 2006

Date

May 2, 2006

Endorsement by Vice President of Workforce

Date

INTRODUCTION

Bellevue Community College (BCC) is seeking authority from the Higher Education Coordinating Board to offer a Bachelor of Applied Science (BAS) in Radiation and Imaging Sciences. Its purpose is to address identified and quantified industry demand for radiation and imaging professionals with advanced technical skills and for supervisors and managers in departments that incorporate a wide range of technologies for patient diagnosis and treatment. No program exists in Washington to serve these needs.

The proposed degree has two concentrations, radiation and imaging management (RAIM) and radiation and imaging technology (RAIT). The degree will provide radiation and imaging professionals access to discipline-specific supervisory and management knowledge and advanced technical skills that will help to fill the well documented and chronic shortage of radiation and imaging professionals for a field that continues to grow and evolve rapidly. At the full enrollment level of 40 FTEs annually, set by the Washington State Legislature in 2006, the program expects to produce 35 managers and advanced technologists to respond to the demand annually after three years of operation.

Four associate of applied science degree programs -- radiologic technology, diagnostic ultrasound, radiation therapy, and nuclear medicine -- will articulate to the single applied bachelor degree program. They share a number of commonalities in that they require a common scientific educational foundation, use radiation or imaging for patient diagnosis and treatment, and incorporate new technologies that are blending these fields. Imaging specialties are combined in most clinics into one department and medical images provide crucial information for radiation therapy. Thus, it is important for managers to have solid working knowledge of all four fields.

BCC is the only college in Washington offering highly rigorous and well-respected educational programs in all four fields. BCC has used this expertise to develop the curriculum and clinical involvement necessary for a successful bachelor degree program in radiation and imaging sciences. Although this degree is not currently offered in Washington, similar radiation and imaging baccalaureate degrees are offered in other states. In addition, BAS graduates will be prepared for admission at the University of Washington School of Public Health and Community Medicine to their master of public health or master of health administrations programs, enabling BAS students further educational and career advancement.

BCC's applied bachelor program will effectively meet the needs of technologists and employers, provide Washington with a more highly educated radiation and imaging workforce, and address the changing nature of these specialties. The degree has been endorsed by the BCC Curriculum Advisory Committee, college administration, the Board of Trustees and the Washington State Board for Community and Technical Colleges.

RELATIONSHIP TO INSTITUTIONAL ROLE, MISSION AND PROGRAM PRIORITIES

The Bellevue Community College mission states:

> *BCC is a comprehensive and innovative college that advances the life-long educational development of its students consistent with their needs, interests, and abilities while strengthening the economic, social, and cultural life of its diverse community. The college accomplishes this purpose by providing high-quality, flexible educational programs and services that are academically, geographically, and financially accessible. (2004)*

The bachelor of applied science degree is *comprehensive and innovative* as the first program of its kind in the state, and in its program design, combining management and technology in one degree to meet the expressed needs of the radiation and diagnostic imaging community.

The program *advances the life-long educational development of its students* by offering an educational path that will provide career advancement opportunities and professional education to working technologists and graduates of diagnostic imaging and radiation associate degree programs. This degree will be the only program in Washington to offer working technologists and graduates from the state's radiation and imaging programs an opportunity to accomplish their educational goals and obtain necessary skills for career advancement.

The BAS is a direct outcome of community need for programs that *strengthen the economic life of our community*. BCC began developing the bachelor of applied science degree in response to a documented substantial demand from hospitals, clinics and practicing technologists throughout the state. They asked for a bachelor degree program that would develop radiation and imaging management skills and advanced imaging and radiation training beyond the state's two-year programs. The program directly responds to the well documented skills gap and employment gap in health care, a key growth industry.

The new bachelor degree program also supports the college's mission of *providing high-quality, flexible educational programs and services that are academically, geographically, and financially accessible*. The program will be offered on evenings and weekends and in distance education formats, making it accessible to working professionals and transfer students throughout the state, regardless of where they live and work.

BCC reaffirms its purpose, defined by WAC28B.50.020, as a two-year college that provides high-quality workforce programs that address the needs of its community, and views the applied bachelor program as a logical extension of serving that defined need.

The applied baccalaureate degree will strengthen the college's mission by creating a new pathway that better serves the needs identified by the college's constituents. The comprehensiveness of this program will expand service to students and is a significant addition to the health care industry, working technologists and the patients they serve.

DOCUMENTATION OF NEED FOR PROGRAM

Bellevue Community College conducted extensive research to validate industry demand for the proposed radiation and imaging sciences BAS program. Sources included (1) national and regional Bureau of Labor Statistics reports; (2) professional organization studies; (3) Washington Higher Education Coordinating Board reports; and (4) Workforce Training and Education Coordinating Board reports. Moreover, BCC conducted extensive direct research through a large employer survey and an industry focus group to validate need for the program. All sources contributed to forming a picture of strong and sustained demand for graduates from the proposed program.

Industry Demand for Technologists to Have a Bachelor Degree

The health care and radiation and imaging technology industries in Washington mirror the trends at the national level. The main factors supporting the need for the proposed program are:

- A high rate of job growth in radiation and imaging occupations (between 21 and 35% by 2012), along with a high vacancy rate (5 to 10%), and a projected high retirement rate (only 14.5% of technologists practicing in 2001 were under the age of 30).
    - In Washington, based on a total radiation and imaging technologist employment of 5,000, this translates to an **additional** 1,050 to 1,750 new technologist positions through 2012, with 250 to 500 currently unfilled positions, and 4,275 incumbent workers over the age of 30.
- Changing credentials and skill requirements, an industry push for technologists with four-year degrees, increased complexity of the field, and emergence of advanced technologists with training in different radiation and imaging technologies that combine them into new specialties.

  Based on data from the American Registry of Radiologic Technologists (ARRT), it can be estimated that 30% of current technologists will need upgraded skills through a baccalaureate degree to fill this skill gap.
    - In Washington, this translates to up to 1,500 incumbent technologists and about 525 of the projected new jobs through 2012 requiring advanced technology skills.
- Increased demand for well-qualified supervisors and managers of radiation and imaging units.

  Based on ARRT data, it is estimated that there is one supervisory position for every 5.6 technologists in the field. It is expected that the need for supervisors and managers will increase to oversee the work of technologists, due to the increased complexity of medical procedures.
    - In Washington, this translates to 893 supervisory positions, many of them currently filled by under-qualified technologists according to industry surveys, and a minimum of 313 projected new supervisory positions through 2012.
- The fields of radiation and imaging are becoming increasingly more complicated, requiring greater independent decision-making, critical-thinking skills, understanding more complex technologies and more rigorous health care regulations.
    - The American Society of Radiologic Technologists (ASRT) and hospitals and clinics nation-wide are calling for the bachelor degree to become the entry-level degree for radiation therapists. In 1999, the ASRT passed a resolution that is expected to become the industry standard, supporting the bachelor degree as the entry-level degree. (ASRT 1999, www.asrt.org/media/pdf/whitepaper.pdf)

According to the 2005 HECB *Analysis of Training Levels by Occupation* report, it is estimated of the projected 140 annual job openings in the fields of radiation and imaging technologies, 33 positions (or 24 percent) will require a BA degree and six will require a master's degree.[1]

In addition there is a rapid push for increased technology skills and knowledge for these professions that is beyond the scope of a two-year degree. In its *2004-05 Occupational Outlook Handbook*, the U.S. Department of Labor Bureau of Labor Statistics[2] cites a number of factors:

- Radiologic technologists who also are experienced in more complex diagnostic imaging procedures, such as CT or MRI, will have better employment opportunities, as employers seek to control costs by using multi-skilled employees.

[1] May 2005 Washington State Occupational Forecast with HECB Analysis of Training Levels by Occupation; http://www.hecb.wa.gov/autheval/dpr/documents/occupationandedtables.xls

[2] The Personnel Crunch: A Crisis in the Radiologic Technology Work Force, American Society of Radiologic Technologists, 2001

- Sonographic technology is expected to evolve rapidly and to spawn many new sonography procedures, such as 3D-sonography for use in obstetric and ophthalmologic diagnoses.
- Uniting into one machine or one procedure technologies that were separate is another major trend. A prominent example is Positron Emission Tomography (PET)/Computed Tomography (CT) scanners that enable doctors to detect and pinpoint cancer with greater accuracy. This trend requires technologists to be cross-trained on multiple equipment and modalities.

Community Demand

Health care employers, professional societies, and community organizations throughout the state support the proposed bachelor program and have written letters of support and endorsement indicating their need for supervisors/managers and advanced radiation and imaging professionals with bachelor degrees.

BCC Employer Survey

BCC sent an employer survey to 48 radiology administrators at hospitals and large imaging centers in the Puget Sound region; 36 surveys were returned. Although employers indicated that bachelor or higher degrees are currently not required until one is applying for an upper-level management position, they emphasized that they would prefer bachelor degrees in applicants for mid-level management positions. Half of those surveyed believe there are not enough people with bachelor degrees in Washington to meet the needs of their organizations. Employers see the biggest barrier to moving people into supervisory and leadership positions is finding the time to train them in the specific management skills for the radiation and imaging field. Other results of the employer survey can be summarized as follows:

- 83 percent indicated that they would hire graduates of a bachelor degree program in radiologic sciences.
- 78 percent indicated they would encourage their employees to pursue such a degree.
- 75 percent would offer tuition reimbursement and other incentives to pursue the degree.

BCC Employer Focus Group

BCC conducted a focus group in June 2005 with eight individuals in supervisory and management positions in radiology, nuclear medicine, and radiation therapy. The group was educationally diverse, ranging from those who acquired their skills on the job to individuals with master degrees. Participants included representatives from medical centers and clinics in both non-profit and for-profit sectors. Their views reflected similar views from the employer survey. Specifically, the focus group identified the following industry trends:

- An increasing number of jobs will require a minimum bachelor degree education.
- A bachelor degree will eventually be required for all supervisory positions.
- More education in new technology areas will be essential.
- More complex management skills will be required of people in supervisory positions.
- A bachelor degree equates to a salary increase in most positions.
- Technologists in supervisory positions have increased responsibilities and would benefit from specific radiation and imaging health care-related management education.

General Trends that Impact the Radiation and Imaging Technology Professions

Washington State Outlook - State and Regional Needs Assessment

The Washington Higher Education Coordinating Board (HECB) states the following in the September 2005 State and Regional Needs Assessment report[3]:

[3] State and Regional Needs Assessment. Washington Higher Education Coordinating Board, September 2005.

- State, regional, and community assessments indicate a need for increased capacity in . . health care.
- The state should reverse the trend of the past three years, when the number of graduate degrees declined in . . health, which are all important fields from the perspective of the state's employers.
- Washington is unique in that we are a leader in innovation and technology-based industries; however, that leadership position has relied heavily on drawing highly trained workers from outside of Washington, especially in . . and health care occupations.
- Health care practitioners . . stand out as an area where a substantial number of workers enter the occupation with a bachelor or complete a bachelor while working.
- Training needs in health care are significant at all levels. . . .

A recent report from the health care personnel shortage task force indicates high levels of need and difficulty hiring qualified workers in a wide range of health care occupations at all educational levels.[4]

Washington State Job Vacancy Survey
Examination of the Washington State Job Vacancy Survey for April-May 2005[5] revealed three relevant facts concerning the lack of sufficient working health care technologists:

- With an estimated 14,195 job openings, health care had more than twice as many openings as any other industry in April-May 2005.
- Health care practitioners and technical occupations accounted for the largest share of vacancies in April-May 2005 (8,918 vacancies, or 13 percent of all vacancies)
- Health care practitioners and technical occupations had the highest percentage of permanent openings (99 percent) and reported the highest percentage of openings requiring certification/licensing (90 percent).

King County Outlook
The Workforce Development Council of King County (WDC)[6] has reported broadly on the field of health care and its projected growth within the county. The WDC identified health care as one of the largest employment sectors in Washington. Hospitals alone employ over 75,000 people - more than Boeing, Microsoft, or Safeway.[7] Employment growth is expected to continue, creating over 10,000 new health care jobs in Seattle-King County alone by 2012. Of these 10,000 new jobs, nearly 60 percent are expected to be in professional/technical classifications.[8] In 2004, employers reported over 8,000 job vacancies for health care practitioners and support personnel.[9]

Student Demand
The proposed BAS program will draw students from the following populations: (1) BCC graduates in radiation and imaging sciences; (2) graduates from other similar associate degree and certification programs; (3) incumbent workers who want to move into management; (4) incumbent workers who want to acquire advanced technology skills; (5) technologists and students who need a bachelor degree, once it is enacted or adopted as the industry standard.

[4] Progress 2004: A Report of the Healthcare Personnel Shortage Task Force. Workforce Training and Education Coordinating Board, December 2004; http://www.wtb.wa.gov/HCRPT05.PDF
[5] Washington State Job Vacancy Survey. Washington State Department of Employment Security, July 2005; http://www.workforceexplorer.com/admin/uploadedPublications/5159_JVSApr-May_05.pdf
[6] Sector Analysis: Health Care. Workforce Development Council of Seattle-King County, 2005; http://www.seakingwdc.org/Templates/be_secini_hc.html
[7] The Business of Caring. Washington State Hospital Association, 2004.
[8] Economic Contribution of the Healthcare Industry to the City of Seattle. June 2004.
[9] Progress 2004, Healthcare Personnel Shortage Task Force. December 2004.

BCC conducted state-wide surveys of working technologists and students in radiation and imaging technology programs to assess the level of interest in the new program. Of the 169 student responses, 79.7 percent (135 students) indicated they would be interested in participating in a bachelor degree program. Professional growth and career advancement were the primary reasons cited for interest in the program.

In order to estimate the size of the student population for the BAS program, BCC reviewed state and regional employment statistics, provided by the Bureau of Labor Statistics, and employment trends, reported by radiation and imaging professional associations. Even with conservative estimations and assumptions, data presented demonstrate substantial demand for the proposed program from both program graduates and incumbent worker populations.

Graduates from BCC Radiation and Imaging Technology Programs
BCC is the only college in the state to offer programs in all four areas of radiation and imaging sciences. The four programs graduate a total of **84** students each year. BCC graduates account for over one-third of the practicing technologists in the state.

Graduates from Other Radiation and Imaging Technology Programs in Washington
Graduates from the other six imaging programs in the state (Bellingham Technical College and Tacoma Community College, Wenatchee Valley College, Yakima Valley College, Sacred Heart Hospital and Pima Medical Institute) will be eligible to apply for entry into the program. The number of graduates from these combined programs in 2004-05 was **161.** Clark College, Columbia Basin College, and Spokane Community College are planning radiology programs and will become additional feeders into BCC's applied bachelor degree when they are approved.

Incumbent Technologists Who Would Benefit from the Proposed BAS Program
BCC's radiation and imaging associate degree programs draw students from across the state, and the college expects a similar trend for the BAS program. Therefore, statewide labor statistics were examined to determine the size of the population of incumbent workers who might benefit from the BAS program.

WA State Bureau of Labor Statistics — 2007 Employment Projections	Seattle-King County	King – Pierce - Snohomish Counties	State of Washington
Diagnostic Medical Sonographers	233	398	771
Nuclear Medicine Technologists	116	167	342
Radiologic Technologists	1,110	1,777	3,736
Technicians and Radiation Therapists	171	265	298
Total Incumbent Technologist Population	**1,630**	**2,607**	**5,147**

Incumbent Workers Who Want to Move into Supervisory and Management Positions
The American Registry of Radiologic Technologists (ARRT) lists 4,200 technologists and 635 managers, supervisors and chief technologists in Washington, which equates to one supervisor for every 5.6 technologists. For all four fields, this would equate to about 926 managers and supervisors. Moreover, it is expected that the ratio of supervisors/managers to technologists will continue to increase based on the following trends: (1) convergence of diagnostic and therapeutic technologies and practices; (2) increased diversity and flexibility in the technologist staff; (3) increased regulations and complexity of health care insurance management plans; (4) increased complexity of care; and (5) greater need for communication with patients.

BCC surveyed working technologists across the state, receiving a total of 378 responses; 69 percent expressed a strong interest in pursuing the proposed bachelor degree. Reasons included: (1) personal satisfaction; (2) professional growth; and (3) career advancement.

The following table presents a very conservative estimate of both categorical and total demand.

Planning Projection for BAS Program Annual Pool of Applicants				
	BCC graduates	**Graduates from other WA colleges**	**Incumbent workforce Seattle-King County (2007)**	**Incumbent workforce Washington (2007)** (excluding King Co.)
Total population	84	161	1,630	3,517
Estimated percentage of applicants	10-30%*****	10-30%*****	1-5%	1-5%
Estimated population with interest in BAS program	8 to 25	16 to 48	16 to 81	35 to 176

*****Actual percentage of program graduates who expressed interest in the BAS program from survey is **80**%

Using current state and national transfer rates, provided by the SBCTC, for new program graduates to determine annual demand for the program, the 245 annual two-year Washington radiation and imaging program graduates would potentially result in 24 applicants at 10 percent and 73 applicants at 30 percent. Factoring in demand from the statewide incumbent workforce at a low of one percent per year would generate 51 applicants and 257 applicants at five percent. Therefore, the program could expect to attract between 75 and 330 applicants a year.

STATEWIDE STRATEGIC MASTER PLAN FOR HIGHER EDUCATION

Goal 1: Increase Opportunity for Students to Earn a Degree

The proposed Radiation and Imaging Sciences BAS will be the first bachelor degree in Washington to focus on both advanced technology and management related to radiation and imaging technology. Students will have access to a bachelor degree in their field at a reasonable cost without having to leave the state. The BAS degree will also provide a direct pathway for those who want to obtain a master's degree in health administration or public health.

For students with an associate degree or certificate in radiation therapy, radiologic technology, diagnostic ultrasound, or nuclear medicine, there is no public university option in this state where they may transfer as juniors. Without a bachelor degree, it is nearly impossible to obtain a graduate degree in a health science field. This lack of a degree pathway closes the door on employment opportunities for technologists, which was corroborated by health care organization employers who responded to the college's survey or participated in a BCC focus group.

The bachelor of applied science degree will provide an essential advanced education opportunity where none currently exists to the 5,000 practicing radiation and imaging technologists in Washington and the 245 annual graduates in radiation and imaging programs.

Goal 2: Respond to the State's Economic Needs

The health care industry is a driving economic sector for the state of Washington. Because the fields of radiation and imaging are becoming increasingly more complicated, requiring greater independent decision-making, critical-thinking skills, understanding of more complex technologies and more rigorous

health care regulations, the American Society of Radiologic Technologists (ASRT) and hospitals and clinics nation-wide are recommending the bachelor degree to become the entry-level degree in the field. Health care employers have expressed a need for radiation and imaging supervisors and managers who have both technical preparation and an understanding of management principles. Currently, they must rely on managers who cannot obtain the proper educational preparation. This BAS will combine core knowledge and skills in the essentials of health care business and management with advanced technology skills, thereby creating more effective managers.

Employers also need technologists with advanced certifications to provide services in multiple or emerging technologies. This BAS will teach new complex technical skills to radiation and imaging technologists to provide better patient services and more efficient departments.

Policy Proposal 3: Increasing The Number of Degrees In High-Demand Fields

At full capacity in three years the proposed BAS will produce 35 graduates each year in a sector of health care that reports sustained high growth and high vacancy rates. (See Washington State Job Vacancy Survey data).

Policy Proposal 6: Meeting Regional Higher Education Needs

The BAS proposed by Bellevue Community College will help meet the high demand for bachelor degree education in King County and relieve some enrollment pressure on King County baccalaureate institutions, identified in both the HECB *State Regional Needs Assessment Report* (February 2006, revised) and the *Baccalaureate Capacity Study Findings and Recommendations* published by the Washington State Board of Community and Technical Colleges (January 2005).

In the HECB *State Regional Needs Assessment Report*, King County was identified as one of the regions that will experience substantial enrollment pressure due to population increases by 2010, requiring an additional increase of 3,651 bachelor-level FTE to serve the region. The report went on to say that the "county has a solid institutional infrastructure in place that will likely need to be expanded to accommodate increased enrollments before 2010."

The 2004 baccalaureate capacity study conducted by the Washington State Board of Community and Technical Colleges reported the following findings[10]:

- Technicians moving from their specialty into management and those planning to work at a more advanced level in their professional/technical specialty need education beyond the initial associate degree. Industry representatives favor development of additional applied baccalaureate degrees in both management and professional technical specialization.
- The study documents the need for 3,000 additional FTE at the junior and senior level to meet current and future demand to 2010 for baccalaureate degree options for technical degree graduates. This demand will not be met entirely by the growth already planned in institutions currently grantors of baccalaureate degrees.
- Community or technical college bachelor degrees are a valid alternative used in other states for meeting similar needs, such a BAS in Radiologic Technology or a Technology Management degree.

Policy Proposal 9: Reducing Barriers For Non-Traditional Students

The proposed BAS will be offered in the evening and weekends and via distance education formats to serve the educational needs of place-bound students and incumbent workers. The program offers students access to a bachelor degree in their field at a reasonable cost without having to leave the state. The

[10] Baccalaureate Capacity Study Findings and Recommendations, Washington State Board of Community and Technical Colleges, January 2005

program design includes a prior learning assessment provision that will enable students to receive credit for previous training and experience, thereby shortening the time to graduation. BCC has also had success in recruiting diverse populations into the associate degree programs that will feed into the bachelor program; the college will employ similar recruitment strategies to encourage a diverse student population in the bachelor program.

RELATIONSHIP TO OTHER INSTITUTIONS

No other colleges or universities have filed Notices of Intent with the Higher Education Coordinating Board for a bachelor degree in radiation or imaging sciences.

The program BCC has developed is unique in this state, as there is no other bachelor degree in radiation or imaging technologies that provides both advanced technology and management in one degree.

Seattle University (SU) offers a bachelor of science in diagnostic ultrasound that is different from the program proposed by BCC. The Seattle University program prepares its graduates for primary certification in diagnostic ultrasound, the same certification received by students in associate degree programs offered by state community and technical colleges. Every student in the BAS program will already hold basic national certification.

SU students have one general management course as part of their curriculum, rather than the in-depth management preparation offered by the BAS management concentration.. Moreover, the SU program does not offer advanced coursework, as the BAS does, for secondary certification in disciplines, such as computed tomography (CT), magnetic resonance imaging (MRI) or positron emission technology (PET). BCC's BAS offers a higher level of preparation for those who will be pursuing advanced certifications and those who are seeking education as radiation and imaging managers.

Another unique feature of the BAS R & I is that every student will learn about the interrelated fields of radiologic technology, diagnostic ultrasound, radiation therapy, and nuclear medicine -- fields that are merging in the clinical environment. Students who will assume leadership roles within their departments, either as managers or advanced technologists, must have an understanding of all four fields.

Graduates who have an associate degree or certificate in radiation therapy, radiologic technology, diagnostic ultrasound or nuclear medicine and want a bachelor degree in their field that does not duplicate their associate level coursework must seek education in other states. No public college or university in Washington accepts these associate degrees for transfer into a bachelor degree program.

BCC has worked with and surveyed colleges and health care organizations and employees throughout the state to develop its proposal. The college has received overwhelming endorsement for the proposed degree from the health care sector, government and public organizations, and higher education institutions. BCC is working with other community and technical colleges state-wide that offer imaging programs to offer articulation agreements for the proposed bachelor degree. The Washington State Hospital Association, the Washington Society of Radiologic Technologists, the Workforce Development Council of Seattle-King County, local city governments and community organizations, and hospitals and clinics throughout the state, including the Fred Hutchison Cancer Research Center, Multicare Health System, Swedish Hospital, Overlake Hospital, Evergreen Hospital, and many others, have written letters of endorsement and support for the BAS. Hospitals and clinics across the state have offered the use of their advanced imaging equipment and medical libraries for students in the program. Employers have offered tuition assistance to their employees for the program.

CURRICULUM

Credit Hour Requirements and Degree Completion Requirements

The Bachelor of Applied Science in Radiation and Imaging Sciences is a 180-credit program with 90 credits fulfilled by entrance prerequisites. Students entering the program as juniors are required to have demonstrated technical proficiency in their field through achievement of *national professional certification* in radiologic technology, diagnostic ultrasound, radiation therapy or nuclear medicine. This certification is demonstration of the candidate's strong mastery of scientific preparation necessary for success in the upper division program. Admission prerequisites also require the equivalent of *English composition*, *intermediate algebra*, two courses in *human anatomy and physiology*, and courses in *humanities and social sciences* to ensure satisfaction of lower division general education requirements. The admission prerequisites are demonstration that each student has the essential preparation and fundamental knowledge that is essential to succeed in the upper division program.

Degree Design and General Education

BCC has modeled the upper division curriculum design on: (1) a review of current literature; (2) successful four-year radiation and imaging programs in other states; (3) standards of radiation and imaging professional accrediting societies; (4) identified regional employer needs, validated through targeted focus groups and surveys; (5) general education requirements at Washington bachelor degree institutions; (6) general education requirements at the associate degree programs from other colleges; and (7) entrance requirements for master degree programs at the University of Washington School of Public Health and Community Medicine. The resulting curriculum incorporates discipline-based, general education, and elective courses that build progressive rigor and sophistication and are designed to develop the broad knowledge and focused field coursework characteristic of four-year degrees.

BCC is committed to ongoing quality improvement within the applied bachelor program through a comprehensive and ongoing assessment process that includes internal and external review in order to assure the new degree program meets standards for quality and rigor and, as well, fulfils identified industry-based needs.

In designing the BAS degree, the college sought advice from working radiation and imaging sciences professionals on course elements that would best prepare graduates for work in the field. Built into the curriculum are the core technical knowledge and foundational skills identified by this group as critical to the success of managers and advanced technologists. These include specific courses in the laws and regulations unique to the radiation and imaging industry, organizational theory, management, and others; and, as well, specific content that develops skills in critical thinking, problem solving, communication, teamwork, cultural sensitivity, computation skills, among others.

The general education requirements for the BAS are an integral part of the degree and are similar to those of other bachelor degree programs, in that they offer breadth and depth, rigor and sophistication outside of the field. BCC has a well-designed general education program of long-standing that was commended by the Northwest Commission of Colleges and Universities in BCC's recent accreditation review. BCC's model was extended for the BAS design. The BAS program admission prerequisites ensure that students transferring from other colleges will have met lower division general education requirements.

The BAS four-year general education requirements total 75 credits and include:

- 15 credits in communication;
- 15 credits of quantitative reasoning;

- 15 credits (or more) of natural science;
- 15 credits in responsibility; and
- 15 credits in cultural traditions.

Three of these courses are taught at the 300-level because they deliver advanced content in an applied context in conjunction with critical thinking skills to help students better understand their responsibilities as managers and lead technologists in the workplace. (See General Education Requirement Comparison Chart in *Appendix 1* that compares BCC's general education requirements with those of regional universities).

In addition, BCC has established the following outcomes for graduates of the BAS program. Graduates will be able to: (1) research, analyze, synthesize, present and discuss information; (2) use independent study, self-motivation, creativity and critical thinking; (3) be actively involved in the selection of project topics and emphasis; (4) apply case studies and real-world scenarios to their fields; (5) interpret, critique, validate and debate information and different perspectives; (6) use business-level verbal and written communication and interactions; (7) reflect a respect for the dignity and individuality of every person; (8) interact in an effective goal-directed manner; (9) collaborate as a member of the health team to facilitate the adaptive process; (10) use adaptation theory in analyzing environmental influences; and, (11) commit to fulfill the responsibilities of a professional practitioner in contemporary society.

Faculty members from the University of Washington School of Public Health and Community Medicine have assisted BCC with incorporating their model for integrating management and leadership skills into the curriculum. UW faculty shared course syllabi with BCC to help ensure the BAS program prepares graduates for advanced study. UW faculty reviewed and provided feedback on the BAS course descriptions and outcomes. After reviewing the BAS curriculum, the Master of Health Administration chair commented that graduates would be well prepared to enter the UW's master of health administration and public health programs (See complete remarks in *External Review* section.)

The structure of the upper division coursework requires students to complete 90 credits:

- 45 credits of general program requirements, including the general education already identified and a 5-credit capstone course;
- 45 credits in one of two specializations – radiation and imaging management (RAIM) or radiation and imaging technology (RAIT).

In both concentrations, RAIM and RAIT, students are required to take coursework in the other specialty to prepare them for identified employment needs.

The BAS program design advances the student's technical expertise, provides breadth of knowledge through general education and elective courses, and meets the specific needs of the student's career plans through discipline-specific courses in two concentrations. The required program core will teach students the essentials of leadership, the fundamentals of the four fields encompassed by the degree, and an overview of the business of health care and radiation and imaging management.

To complete the major, students select a concentration in either radiation and imaging management or radiation and imaging technology. All students will be required to engage in a capstone project designed in conjunction with their advisor to complete their studies.

- The ***Radiation and Imaging Management*** concentration will provide in-depth health care management and organizational theory knowledge and skills, along with an understanding of

technologies outside the students' areas of expertise to enable them to be effective administrators. Graduates in this concentration will be qualified as managers and supervisors in hospitals, radiation and technology clinics, and imaging centers.

- The ***Radiation and Imaging Technology*** concentration will teach advanced technical knowledge and complex skills to facilitate advanced certification in areas like computed tomography (CT), magnetic resonance imaging (MRI) and other specialized fields. This option will help technologists keep pace with rapidly changing technologies and expand into new high demand technology areas, like Fusion Technology.

(Please see *Form 4* for a complete list of coursework by concentration. *Appendices 2 and 3* include a four-year course map along with course descriptions and outcomes.)

Requirements for Admission

The college will continue to be an open door institution and will minimize admission criteria to the essential elements that will ensure incoming students are well prepared to begin bachelor studies, regardless of the origin of their preparation. The college will admit applicants who fulfill the following admission criteria, with consideration given to unique attributes of applicants as identified in a personal essay and letters of reference. A proportionality formula, similar to those that community colleges currently have with state universities, will give applicants from other two-year imaging programs a defined participation rate.

Applicants for the program must have ***both***:

a) Certification (via national exam) in radiologic technology, radiation therapy, nuclear medicine technology, or diagnostic medical sonography, and
b) Demonstrated completion of the following courses, or their equivalent, from a regionally accredited college, with a grade point average of 2.5 or better:
    i. English composition (or assessment beyond that level)
    ii. Intermediate algebra (or assessment into pre-calculus)
    iii. Human anatomy and physiology, 2 courses
    iv. Humanities course
    v. Social sciences course

Each applicant will submit a personal statement, which will be factored into admission decisions. Applicants will have the opportunity to document specific and unique attributes that they will bring to the program. The statement may include information on how culture will assist the applicant to bring better services to the health care field; how the student's culture has had an impact on the student's life and what he/she has learned as a result; any personal or imposed challenges or hardships the student has overcome in pursuing his/her educational goals; involvement in research, community service, relevant work experience (paid or volunteer) and the ways in which it has contributed to the student's academic career or personal goals; information about advanced professional certification the applicant has achieved; courses beyond an associate degree the student has completed; or other factors the student deems relevant.

Applicants will also submit two letters of reference from their work place or educational institution for admissions consideration. The college will establish a committee to review the personal statements and letters of reference and identify special attributes or skills that would bring diversity to each cohort and to the work force.

FORM 4

REQUIRED COURSE WORK- PART I

Include this form with new degree program proposals. Staff will post this information and the program proposal on the HECB Web site during the public comment period.

Prerequisite Courses		
Course Number	**Course Title**	**Credits**
Multiple courses	National certification in radiologic technology, diagnostic ultrasound, radiation therapy or nuclear medicine	60
English 101	English composition (or assessment beyond that level)	5
Math 099	Intermediate algebra (or assessment into pre-calculus)	5
Biology 260 and 261	Human anatomy and physiology, 2 courses	10-12
Various	Humanities course	5
Various	Social sciences course	5
(Course numbers and credits may vary from college to college. These are the BCC courses)		
Total Credits		90-92

	General Program Requirements	
Course Number	**Course Title**	**Credits**
MATH 130	Statistics	5
GBUS 101	Introduction to Business	5
ENGL 201 or 270	The Research Paper *or* Technical Writing	5
PHIL 365	Biomedical Ethics: Theory and Practice	5
SPCH 330	Intercultural Communication for the Professional Practitioner	5
ECON 315	Economics of Health Care	5
RAIM 301	Essentials of Imaging and Therapy	5
RAIM 460	Management and Leadership	5
RAIM 475	Capstone Project	5
Total Credits		45

Radiation And Imaging Management (RAIM) Concentration		
Course Number	**Course Title**	**Credits**
RAIM 320	Finance and Accounting for Health Care	5
RAIM 325	Organizational Theory and Behavior	5
RAIM 340	Human Resources Management in Health Care	5
RAIM 350	Legal and Regulatory Aspects of Health Care	5
RAIM 401	Marketing in the Health care Environment	5
RAIM 440	New Business Planning for Health Care	5
15 credits from ***RAIT*** courses (chosen from the following list)		15
Total Credits		45

Radiation And Imaging Technology (RAIT) Concentration		
Course Number	**Course Title**	**Credits**
RAIT 301	Sectional Anatomy	3
RAIT 302	Body Pathophysiology	3
RAIT 303	Neuropathophysiology	3
RAIT 495	Quality Assurance/Accreditation	5
31 credits from ***RAIT*** or ****RAIM*** courses (chosen from the following list)		31
Total Credits		45

Healthcare Management Course Offerings (RAIM)		
Course Number	**Course Title**	**Credits**
RAIM 320	Finance and Accounting for Health Care	5
RAIM 325	Organizational Theory and Behavior	5
RAIM 340	Human Resources Management in Health Care	5
RAIM 350	Legal and Regulatory Aspects of Health Care	5
RAIM 401	Marketing in the Health care Environment	5
RAIM 440	New Business Planning for Health Care	5

Radiation and Imaging Technology Course Offerings (RAIT)		
Course Number	**Course Title**	**Credits**
RAIT 301	Sectional Anatomy	3
RAIT 302	Body Pathophysiology	3
RAIT 303	Neuropathophysiology	3
RAIT 304	Oncology	4
RAIT 305	Radiobiology	3
RAIT 310	Computed Tomography (CT) Instrumentation & Procedures	3
RAIT 311	Clinical Practicum – CT	12
RAIT 315	Magnetic Resonance (MRI) Instrumentation & Procedures	3
RAIT 316	Clinical Practicum – MRI	12
RAIT 320	Interventional Procedures	3
RAIT 321	Clinical Practicum – Interventional	12
RAIT 325	Mammography	8
RAIT 326	Ultrasound Physics for Mammographers	3
RAIT 327	Breast Ultrasound for Mammographers	3
RAIT 328	Ultrasound Equipment for Mammographers	3
RAIT 340	Pediatric Ultrasound and Fetal Echo	3
RAIT 341	Pediatric Echocardiography	3
RAIT 350	Nuclear Cardiology	5
RAIT 360	Positron Emission Tomography	3
RAIT 361	Clinical Practicum – PET	12
RAIT 365	Molecular Imaging/Therapy	3
RAIT 370	Radiation Oncology I	3
RAIT 371	Radiation Oncology II	3
RAIT 380	Advanced Radiation Physics/Dosimetry	3
RAIT 401	Advanced Sectional Anatomy	2
RAIT 410	Advanced CT Procedures	3
RAIT 415	Advanced MRI Procedures	3
RAIT 435	Advanced Doppler/Ultrasound Instrumentation	3
RAIT 470	Advanced Oncology for Therapists	3
RAIT 490	Information & Image Mgmt	3
RAIT 495	Quality Assurance/Accreditation	5

Articulation with Two-Year Colleges

Bellevue Community College is in the process of completing articulation agreements with all Washington community and technical colleges offering radiation and imaging programs. These agreements will be with Bellingham Technical College, Tacoma Community College, Wenatchee Valley College, and Yakima Valley College, and, as well with the planned programs at Columbia Basin College, Clark College, and Spokane Community College. The agreements will direct students to complete preferred general education prerequisites that will facilitate transfer.

When, Where and How the Program Will Be Offered

BCC plans to begin offering the bachelor of applied science degree in radiation and imaging sciences fall quarter 2007. The program is designed to address the time restrictions of working professionals and will be taught on evenings and weekends, through a combination of on-campus classroom and distance formats, both synchronous (real time) and asynchronous (online).

Building on BCC's already successful programs in distance instruction, the college plans by the third instructional year to deliver its curriculum statewide to students who are unable to come to the campus to take courses. At that time, if a teaching site is needed to expand service delivery, the college will apply to the Higher Education Coordinating Board for permission to proceed. The college plans to deliver courses using a combination of live synchronous (real-time) web-based instruction and asynchronous online instruction. Students would attend live class sessions at their computer desktop 1-2 times per week and complete the remaining coursework in an online format at their convenience.

In addition to on-campus instruction, students will perform their practicum studies throughout the state through long established clinical partner sites that have served the associate degree programs. Current clinical sites which will be extended to the BAS program are shown in *Appendix 4*.

INFRASTRUCTURE REQUIREMENTS

Library Resources

BCC Library Media Center

Funding for a .25 FTE librarian has been included in the budget during the planning year to develop the core collection for the bachelor program, and $38,000 has been allocated for the purchase of books and materials based on estimates of need by the library staff. Beginning in 2007, $5,000 per year will be earmarked for subscriptions to professional journals to add to the already well developed library collection that supports the associate level allied health programs.

The BCC librarian charged with expanding the BAS collection has experience in health sciences resources and will work with staffs at university libraries to ensure that the collection will meet both programmatic and accreditation requirements. Beyond the funds allocated in the BAS budget, in 2005-06 the Library Media Center (LMC) was provided $100,000 in one-time funding to improve its collection and has increased the LMC budget by $25,000 per year for the purpose of adding to the college's core collection. In addition nearly $5,000 per year is allocated from Perkins funding to pay for the Cumulative Index for Nursing and Allied Health Literature (CINAHL). Because the college has a substantial number of allied health programs, their library resources include 38 online and print subscriptions to a variety of allied health journals.

Library Partnership with Eastern Washington University

Eastern Washington University (EWU) has a cooperative agreement with BCC to offer bachelor degree programs on the BCC campus. Because of this, the complete EWU library collection is available to all BCC students, which will give BCC baccalaureate students complete access to a library from an

accredited four-year university with depth and breadth in general education and elective fields. Since EWU has a four-year degree in health services administration, students will also gain access to some additional health care management books, periodicals, and media resources that will augment BCC's holdings. Students have the ability to search the EWU library database through computers at BCC and place their request which is delivered to the BCC library within 24 hours.

Partnerships with Medical Center Libraries
Students in the current BCC allied health programs have access to the extensive medical libraries at all regional medical centers throughout the state where BCC has clinical sites. This access will be extended to all BAS students.

Technology Resources
Bellevue Community College employs a full complement of online services through MyBCC.net, the BCC portal, to assist students. Services include admissions, schedule planning, book store purchases, records and grades, financial aid, registration services, advising, communication with faculty, complete library services, degree audit, and general education program-requirement audit, among others.

BCC also offers full-enterprise online courseware, WEBCT-Vista, that will place on the worldwide web all course materials and content and facilitate group discussions. Students may use the site to converse with faculty, check course assignments, participate in threaded discussions, and participate in other interactive services.

A 200-computer, open laboratory is available on the BCC campus until 10:30 p.m. daily and on weekends, as are other laboratories and study centers should students want access to online resources.

Space Requirements and Equipment Needs
Because the on-campus portion of the bachelor program will be taught on evenings and weekends, the BAS program will incorporate the same classrooms and equipment used by BCC's existing four programs feeding into the degree. Office space has been reserved for the program.

The advanced imaging science classes will require no specialized equipment beyond what is currently offered in BCC associate degree programs. These programs have a longstanding and successful track-record of working with industry partners to provide clinical instruction for students. Hospitals and clinics have already agreed to participate as clinical sites for the bachelor practicum courses for advanced technical training involving hands-on practice with radiation and imaging equipment. This industry participation also represents a major in-kind contribution by the health care industry in support of the program. Clinical sites with current BCC affiliates are listed in *Appendix 4.*

FACULTY

The total number of FTEs allocated to the program at full capacity (year two) is 40 FTE. To support this level of instruction, the full time equivalent faculty load will be: in year one, 1.73 FTEF; in year two, 2.96 FTEF; in year three, 3.1 FTEF; and in year four, 2.96 FTEF.

A profile of the anticipated faculty identified to support the program is provided in *Form 6,* at the end of the proposal. Percentage of effort in program was determined by calculating the percentage of credits taught in the BAS in Radiation and Imaging Sciences program in relation to credits taught for full-time annual course load (45 credits).

STUDENTS

The bachelor program is designed for immediate graduates from radiologic technology, diagnostic ultrasound, radiation therapy and nuclear medicine programs; those who have gained their basic credential via a certificate program or on the job training; and professionals working in the fields of radiation and imaging technologies. Because courses will be offered at night and on weekends, it will be particularly practical for those who must continue to work while they complete their degree.

The college expects to admit forty part-time and full-time students annually to meet its FTE target. The program is designed to serve working professionals throughout the state who need a bachelor degree for career advancement. Five-year projected enrollments are included in *Form 5*.

BCC is committed to student diversity and has worked to ensure that the college's existing programs attract a diverse population. The college's experience in recruiting targeted populations has resulted in a combined average diversity of 22 percent and six percent Hispanic students, as of fall 2005, for the BCC associate degree programs that feed into the bachelor degree. A similar approach will be used to attract a diverse student population into the degree completion program. The plan includes:

- Recruiting BCC program graduates who are people of color to serve as role models and to make presentations to currently enrolled associate degree students to encourage them to pursue the bachelor degree;
- Engaging in targeted marketing in hospitals and clinics and through mailed marketing materials to encourage technologists of color to apply to the program; and,
- Working with hospitals and clinics on additional strategies to attract a diverse student body to become their advanced technologists and managers in a few years to help increase the percentage of people of color working in these fields.

PROGRAM ASSESSMENT

The program objectives for the bachelor of applied sciences in radiation and imaging sciences are:

- Every BAS graduate will gain a core of knowledge and skills in the essentials of health care business and management that will enable them to become effective supervisors and managers or advanced technologists.
- Every BAS graduate will learn advanced imaging and radiology technologies that will allow them to keep pace with rapidly changing technologies.
- Every BAS graduate will learn critical thinking, communication and other general education concepts that will augment and under-gird advanced courses and/or practice in radiation and imaging sciences.
- Graduates concentrating in advanced radiation and imaging will learn new complex technologies to achieve advanced certifications that allow them to provide services in crossover or emerging technology fields and increase their utility to their employers.
- Graduates concentrating in radiation and imaging management will learn in-depth management and organizational theory concepts to enable them to be effective health care administrators as well as to provide the basis for advanced studies in health care management.
- All graduates will gain a broad understanding of the four imaging and therapy modalities to become more effective leads and managers.

- Graduates of radiation and imaging technology programs and working technologists will have an avenue to obtain a baccalaureate degree in their field within the state of Washington at a reasonable cost and without having to leave their communities.

Assessment for the proposed BAS program will build upon the comprehensive student achievement and program assessment processes already in place at BCC. At the associate level, these include: a set of Institutional Performance Indicators, the Program Effectiveness Process (PEP), the Five-Year Program Review, annual CAAP testing (College Assessment of Academic Proficiency), and the Authentic Assessment of General Education. The processes that are appropriate at a bachelor level will be extended, and others will be developed and implemented as needed, working closely with industry reviewers and an external independent consultant from a four-year institution that offers a related bachelor program. The Curriculum Advisory Committee will provide an efficient, fair, and rigorous process to ensure consistency and quality in courses and program offerings. The Office of Institutional Research will regularly collect and present data to improve planning, effectiveness, assessment, and decision-making. In addition to the ongoing assessment and effectiveness processes in place for all educational programs at BCC, a specific assessment plan will be developed and implemented for the proposed BAS program and the program faculty and staff will evaluate program success against identified program outcomes.

Industry will be closely involved in the ongoing review of the curriculum through advisory committee and expert review processes. Outside evaluators from industry and education will be engaged in the curriculum development and implementation phase to ensure rigor of the content and learning methodologies.

The following elements summarize the draft assessment plan for the BAS program.

Effectiveness of curriculum/ program — continuously refines the curriculum and program design, keeping the program current, including discipline-based, general education and electives using the same rubric format that BCC uses to measure general education outcomes in the associate degree program	
• Course evaluations by students	• Effectiveness of the curriculum and teaching methods for each course • Effectiveness of the program in skills and knowledge progression
• Clinical practicum evaluation by students and by employers	• Adequate balance of knowledge and skills, theory and practice • Effectiveness of program in meeting students' expectations • Effectiveness of program in meeting employers' expectations
• Student survey and/or focus group mid point through the program and at graduation	• Effectiveness of the program in skills and knowledge progression • Adequate balance of knowledge and skills, theory and practice • Effectiveness of program in meeting students' expectations • Effectiveness of institutional and program resources and support • Preparedness of faculty • Preparedness of students upon entering individual courses • Preparedness of students upon entering the program
• Program statistics	• Student retention • Student course success • Student progression through program • Correlation of student success and training/ job experience prior to entry into the program
• Survey of BAS program faculty	• Preparedness of students upon entering individual courses • Preparedness of students upon entering the program
Graduate follow-up and industry feedback — assesses effectiveness of program in meeting career goals and employer expectations and use findings to refine curriculum and teaching methodologies	
• Survey of program graduates six months after graduation	• Effect of program completion on career • Effectiveness of program in meeting job expectations • Wage and career progression

	• Successful score in an advanced certification
• Survey of employers of program graduates six months after graduation	• Effectiveness of program in meeting job expectations • Observed increased skills and performance • Perceived strengths and weaknesses of current program
Oversight by a BAS Industry Advisory Committee – provides ongoing support and review of the program	
• BAS Program Advisory Committee (meets quarterly)	• Completeness and relevance of the curriculum to industry needs • Trends in industry, technologies, practices and job markets
Survey of faculty satisfaction —assesses adequacy of program support and faculty training	
• Survey of BAS program faculty	• Effectiveness of institutional and program resources and support • Preparedness to teach the curriculum
Impact on two-year programs — assesses impact of BAS program on existing degrees	
• Survey and/or focus group of students enrolled in two-year degree programs	• Impact of BAS program on the quality of the 2-year degrees • Impact on faculty availability and support • Impact on overall institution and program resources and support • Impact on culture
• Survey of faculty teaching the two-year associate degree programs	• Impact of BAS program on the quality of the 2-year degree • Impact on faculty availability and support • Impact on overall institution and program resources and support • Impact on culture
Impact on BCC resources/ administration — assesses overall impact of BAS on college	
• Survey and/or focus group of college administrative support units	• Impact of BAS program on the unit resources • Impact on overall institution and program resources and support • Impact on culture

STUDENT ASSESSMENT

A graduate of the radiation and imaging sciences bachelor degree program will be able to:

- Function in a supervisory or management role in a radiology department or imaging clinic.
- Demonstrate an understanding of finance, legal issues, human resources, and leadership as they pertain to the field of health care and particularly radiologic science and medical imaging.
- Demonstrate the breadth and depth of the educational preparation through the completion of a capstone project.
- Have the necessary preparation to pass national certification examinations in a variety of radiation and imaging specialty areas.
- Evaluate legal, ethical and economic issues that pertain to the graduate's professional field.
- Discuss the planning and implementation of a new medical imaging or therapy venture, including capital costs, operating revenue expectations, staffing, marketing, and contracting.

In addition to a wide range of classroom assessments, students will be required to complete a capstone project, an integral part of the curriculum that demonstrates the breadth and depth of the student's cumulative learning experiences. The program is competency-based; students must demonstrate their abilities and knowledge in a wide variety of individual and team activities including hands-on practices, case studies, research and presentations, and knowledge-based assessments. The program and its students will be assessed as part of the BCC's Authentic Assessment of General Education as applied to the baccalaureate degree level.

Since most students in the program will be working professionals, student course evaluations will be carefully reviewed to determine if the content of instruction provides learning relevant to their work place situations. This feedback loop will aid instructors to ensure courses help students meet their learning objectives. Please see “graduate follow-up and industry feedback” in the above chart for additional ways that student learning outcomes will be measured.

BUDGET

The new BAS program will have an impact on many areas of the college, but the college anticipates that it can assimilate the small number of bachelor degree students with no monetary impact on most departments. The college is dedicating specific funding to some areas, such as the library, student services, administration, and new program faculty, which will experience a monetary impact. The program expenses and expected revenue beginning with the first academic year of the program are shown in *Form 7*. Beginning 2007-08, state funding has been allocated at $6,300 per FTE and $4,100 per FTE tuition for 20 FTE for a total of $208,000. In 2008-09, the allocation will increase to 40 FTE for total annual state funding of $416,000. In addition, BCC anticipates $12,500 annually in program revenue.

Program expenses in year one are estimated about $165,000 beyond the state allocation, tuition, and program revenue. BCC will contribute contract revenue fund balances to this effort. In years two and three, it is estimated there will be a combined $25,000 institutional commitment to launch the synchronous learning system. The funds for this will come from a grant already secured for this purpose. By year four, the program will be totally state funded.

FORM 7

SUMMARY OF PROGRAM COSTS AND REVENUE - PART II

Include with a new program proposal or Notification of Intent to extend an existing program. This information will not be posted to the HECB Web site during the public comment period, but it will be available upon request.

Program Expenses					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 4 (full enrollment)**
Administrative Salaries (.5 FTE) Benefits @ 34 %	50,042	50,042	50,042	50,042	50,042
Faculty Salaries Benefits @ 34 %	114,740	188,810	194,883	188,441	188,441
TA/RA Salaries (# FTE) Benefits @ # %	--	--	--	--	--
Clerical Salaries (1 FTE) Benefits @ 34 %	44,548	44,548	44,548	44,548	44,548
Other Salaries (2.2 FTE) Benefits (part-time hourly @ 15% benefits and curriculum development stipends and on-line specialist @ 34% benefits)	119,650	60,812	55,452	46,477	46,477
Financial Aid specific to the program	--	--	--	--	--
Contract Services	7,000	7,000	8,000	8,000	8,000
Goods and Services	29,640	43,000	47,280	47,280	47,280
Travel	3,000	4,800	4,800	4,800	4,800
Equipment	6,000	22,000	22,000	6,000	6,000
Lease or Acquisition	--	--	--	--	--
Other Prior Learning Assessment Professional Development	2,000 8,750	3,000 14,000	3,000 14,000	3,000 14,000	3,000 14,000
Indirect (if applied to program)	--	--	--	--	--
Total Costs	385,370	438,012	444,005	412,588	412,588

Program Revenue					
	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year *4* (full enrollment)**
General Fund: State Support	126,000	252,000	252,000	252,000	252,000
Tuition and Fees (total)	94,500	176,500	176,500	176,500	176,500
Corporate Grants / Donations					
Internal Reallocation					
Other Fund Source (specify) Self-Support Budget	164,870	9,512	15,505	--	--
Total Revenue	385,370	438,012	444,005	428,500	428,500

BUDGET NOTES:

1. *Administrative Salaries*: 50 percent program chair
2. *Faculty Salaries:* combination of full- and part-time faculty that aligns with planned curriculum in *Appendix 2*. Year 1 - 1.73 FTEF; Year 2 - 2.96 FTEF; Year 3 - 3.1 FTEF; Year 4 – 2.96 FTEF
3. *Clerical Salaries*: 50 percent administrative assistant, 50 percent admissions coordinator
4. *Other Salaries:* hourly staff, curriculum development stipends, on-line specialist
5. *Contract Services*: consultants for curriculum development and external review of program
6. *Goods and Services*: library collections and subscriptions; printing of marketing materials, program admissions information, student handbook, and course materials; room rental and coordinators at ITV sites
7. *Travel:* clinical site travel; travel for program chair and faculty to attend conferences
8. *Equipment*: computers for program faculty/staff; hardware and software for classes and distance learning
9. *Other*: stipends for prior learning assessment (PLA); professional development for faculty

EXTERNAL EVALUATION OF PROPOSAL

BCC's responses to the three evaluators' suggestions may be found after all of the external reviewers' comments. Their Biographies are included in *Appendix 5.*

Review of Proposal by Dr. Duane Akroyd, Coordinator Health Professions Education Department of Adult and Higher Education, North Carolina State University

I have reviewed the proposal for the new Bachelor of Applied Science degree program in Radiation and Imaging Sciences submitted by Bellevue Community College, below are my comments.

Strengths

1. The classes are offered on weekends and evenings and the institution is in the process of offering many of the classes online. This will accommodate prospective students currently working in the radiologic sciences and should enhance the marketability of the program.
2. Prospective students may attend either on a part-time or full-time basis. This flexibility will allow those who work full time to continue their educational advancement in the radiologic sciences without leaving the job market.
3. The program labor market information related to the demand was well done with input not only from National Bureau of Labor statistics, the Washington Higher Education Coordinating Board, but also significant stakeholder input from hospitals, other health care agencies and organizations. The need for such a program, given all the sources of input is well documented.
4. The proposed program has a variety of delivery mechanisms ranging from online to face to face and classes broadcast over educational TV.
5. The proposed program is built upon the success of a strong associate degree program in radiologic technology. The current associate degree program faculty have had considerable experience in delivering a variety of associate and certificate programs in the greater Seattle area over several decades. The connections established with the many health care facilities and organizations in the greater Seattle have provided a very solid base of support between industry and academia.

Suggestions for Consideration

1. Perhaps consider an alternative to an open admission policy. I anticipate many more applicants than slots available. While community colleges have been advocates of open door admission, and rightfully so, the move into offering bachelor degree programs also brings other considerations (like possible graduate school for those who may want to continue their education).

2. Regarding the RAIT courses, it may be helpful to list a number of the more standard sequences of courses for the various options open to students to gain specific certifications or proficiencies. For example, if I come into the program as a registered radiographer, how many advanced practice certifications could I get as a regular part of the bachelors degree program (MRI, CT, others)?

Overall impressions

This proposal documented a real need for offering a bachelors degree with specific advanced skills in imaging and management for those professionals currently working in the radiologic sciences in the greater Seattle area and the entire state of Washington. Currently there are no state supported educational programs that offer radiologic science professionals the opportunity to obtain a bachelors degree with advanced skills in the discipline. Given the quantum advances in technology in medical imaging and therapy, this program offers individuals the opportunity to obtained advanced skills via the bachelor degree in their area. Additionally, hospitals and other health care organizations will have a source to obtain potential personnel to fill the advanced imaging and managerial positions that are in high demand.

Overall I found this proposal be a very innovative, educational approach that offers upward educational mobility for practitioners and a good source of advanced practice personnel that have been very difficult for health care organizations to find.

Duane Akroyd, PhD, (RT)R
Coordinator Health Professions Education
Department of Adult and Higher Education
North Carolina State University
Raleigh, NC 27695

Review of Proposal by Richard Carlton, M.S., R.T.(R)(CV), FAERS, Grand Valley State University Radiologic and Imaging Sciences

-----Original Message-----
From: Rick Carlton [mailto:carltonr@gvsu.edu]
Sent: Thursday, January 26, 2006 1:50 PM
To: Paula Boyum
Subject: Initial comments on your proposal

Overall
This is an extremely well researched proposal. There is no doubt in my mind that it will be successful if it is based on the curricular plan, budget, schedule, and articulations proposed. The professions with radiation and imaging sciences desperately need this sort of program because it uses the traditional strong points of two year community colleges in that it values and then builds on existing life experiences to create a new credential that will have strong value in the community.

Consistent with Bellevue's stated goals of initiating new programs, this proposal addresses the critical issues while adhering to these traditional values.

Student Demand
The data you are providing for this criterion are very compelling. The rates are based on both national and statewide data and appear to be applied to your local situation accurately. I am convinced you will have an applicant pool between 50-100/year if adequate promotional activities are planned.

Articulation
Your articulation work is impressive. The number of programs that are committed in writing as feeder schools and the graduate program that is also committed to the endeavor are extremely strong points to justify both starting and funding your proposal. Of this, the strongest point for recruitment is your commitment to work closely with students who declare for the program while they are still completing their associate degree at another school. I suspect this aspect of your proposal alone will guarantee a more than adequate stream of qualified applicants.

Employer Demand
I believe you should be careful with how you emphasize the industry demand for technologists to have a bachelor degree. Here are my concerns:

1. Radiologist Assistant programs are now starting nationwide. I think you should at least mention that the minimum standard that is developing for these programs is baccalaureate with a number of schools now looking seriously at Master level programs. To me this is a broader application of your point and it has the added advantage of also being currently ongoing.

2. Your examples from the *04-05 Occupational Outlook Handbook* are all valid and relevant to your discussion.

Curriculum
As your proposal states, your curriculum design is heavy on administrative elements. Have you considered equalizing the administrative curricula with the advanced radiation and imaging technology concentration? My major concern here is that you have the capstone project within the management courses but there does not seem to be an equivalent weight allocated for advanced radiation and imaging technologies. Have you thought of either a second capstone or a choice of capstones? An appropriate idea for an advanced radiation and imaging technologies capstone might involve clinical experiences that could translate into work toward a post-primary national credential in CT, MRI, etc.

I'm curious why a neuropath course was chosen as the only option after "Body" path. Have you considered a rotating selection of various imaging related path courses (Ob-Gyn, Mus-Skel, GI, GU, etc.)?

Your prior learning option is well conceived and should do much to recognize advanced clinical learning that I suspect many of your applicants will possess (especially those working in the field).

Sustainability
Your library budget is OK but if you intend these funds to cover all of the advanced level specialties a bit more would be useful. We are doing similar things here at Grand Valley State University and we put $100K into library acquisitions initially with about $12K/year for periodicals and new acquisitions since. You certainly don't need to go to that level, and if you are thinking of looking at a PA or UP program eventually, those programs can drive additional library funds later.

Your marketing and other support funding look very good.

Your scheduling plan (PMs and weekends) is well thought through and could become your major element in the success of this program.

Faculty and Staff
Looks good, although you say that you would prefer a doctoral-prepared and advanced clinical-credentialed chair, they are hard to come by at your proposed salary level. If you know your market well or if you have a local identified applicant (or can find one) this comment would not apply. Our radiation therapy director is completing her Master's and has turned down $100K/yr from programs in CA and NV.

Assessment
This is well spoken. Nice job.....

Admission
Very well done. This type of program is important to the huge job of bringing the large numbers of radiation and imaging professionals into a more appropriate traditional degree level. Most of them are functioning at the baccalaureate level although many hold only associate degrees. This program will do much to enhance their skills within more recognizable credentials.
--

Richard R. Carlton, M.S., R.T.(R)(CV), FAERS
GRAND VALLEY STATE UNIVERSITY Radiologic and Imaging Sciences
College of Health Professions, Center for Health Sciences

Comments on Curriculum from Dr. William Welton, MHA Program Director, University of Washington

From: Will Welton [mailto:wwelton@u.washington.edu]
Sent: Fri 4/14/2006 12:24 PM
To: Michele Royer
Subject: Re: BAS curriculum

I have reviewed the draft and find the proposed course content to be quite appropriate and reasonable. Students with this background would be well prepared to enter the UW Executive MHA Program at some future point, should they decide they wish to apply.

I have no substantive suggestions as to modifications of course structure or content.

As to the question of how to bring imaging examples into the classroom, I would suggest the use of guest faculty with experience in the world of imaging management. This should work out quite nicely.

Will Welton

Institutional Response to Recommendations

The college administration, BAS department chair and program faculty have considered the external reviewers' comments and specific recommendations and have incorporated the following items into the program.

The ***admission process*** has been modified from the original proposal from "first come, first served" to a modified selective admission process in keeping with the college's open door policy, similar to the selective admission processes currently used in the college's AA allied health programs. The open door ensures that all students have the opportunity to prepare themselves for application to the program by completing the minimum requirements. The revised selection process is described under *Requirements for Admission.* The selection committee will score elements of the applicants' essays and letters and recommendation in addition to satisfaction of the prerequisite admission criteria in order to rank candidates.

The program description in the college catalogue, college website, advising information, and recruiting information sessions will identify specific courses a student should take to qualify for ***advanced certifications*** and proficiencies, such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) and Breast Mammography. Advanced certification courses in radiation therapy will be added in the future. The ***radiologist assistant program*** mentioned by Mr. Carlton requires that an institution has baccalaureate degree granting authority. After the BAS program is begun, if future funds become available for program expansion, the college will pursue authority to offer the radiologist assistant program.

The ***curriculum*** section, which defines the two concentrations, was rewritten to be clearer: the technology track and management track are similar in their requirements. The capstone course is required of all students, not just the management students, and will be relevant to each student's concentration. The ***courses*** that Mr. Carlton recommends to be added to the curriculum (OB-GYN, mus-skel, etc), are incorporated as sections to be taught in related courses. ***Guest lecturers*** will be a part of the ongoing instruction of the BAS program. The college already supports a ***library collection*** for the AA degrees for

the four feeder programs. The amount mentioned in the proposal is for upper division coursework only. BCC will carefully monitor the library holdings available for students and if the amount dedicated proves to be insufficient, more resources will be dedicated to the program.

Although the recommended salary for the ***program chair*** will make it difficult to recruit from outside the institution, BCC is fortunate to have on staff a highly qualified chair, who holds professional certification, a master degree, and has taught in a similar bachelor program.

FORM 5

ENROLLMENT AND GRADUATION TARGETS - PART I

Include this form with a new degree program proposal or a Notification of Intent to extend an existing program. Staff will post this information to the HECB Web site during the comment period.

Year	1	2	3	4	5
Headcount	40	76	95	95	95
FTE	20	40	50	50	50
Program Graduates	--	15	35	35	35

In response to the HECB inquiry about program size, the program as it is currently defined is optimum. Should additional funding become available, BCC would request the additional FTEs indicated below.

Year	1	2	3	4	5
Max FTE	34	58	62	58	62
Requested FTE	30	53	57	53	57

The additional revenue generated would be used for program enhancements, such as additional full-time faculty, professional development, curriculum development, and sponsored research.

FORM 6

PROGRAM PERSONNEL - PART II

Include this form with a new degree program proposal. This information will not be posted to the HECB Web site during the public comment period, but it will be available upon request

Program Faculty for General Education Courses				
Name	**Credentials**	**Status**	**% Effort in Program**	**Course**
Rebecca Baldwin	MA	FT Tenured	11%	Economics 330
William Payne	Ph.D.	FT Tenure track	11%	Philosophy 365
Alan Yabui	Ph.D.	FT Tenured	11%	Speech 330
David Stacy	M.A.	FT Tenured	11%	Math 130
Steven Yarborough	M.A.	FT Tenure track	11%	English 201 or 270
Andrew Johnson	M.B.A.	FT Tenured	11%	General Business 101
Program Faculty for Required Core Courses				
Ron Radvilas	MS, RT(R)	FT Tenured	50%	RAIM 301, 460, 475
Program Faculty for Radiation and Imaging Management Courses				
Frank Hatstat	JD, MBA	FT Tenure track	22%	RAIM 350, 440
Judy Woo	Ph.D.	FT Tenured	22%	RAIM 320, 340,
Debi Griggs	M.B.A.	FT Tenured	22%	RAIM 325, 401
Total Faculty FTE				**1.82**

Program Faculty for Radiation and Imaging Technology Courses				
Name	**Credentials**	**Status**	**% Effort in Program**	**Course**
Julius Armstrong	MBA, RT(T)	FT	14%	RAIT 304, 305, 380, 435,
Kathy Olson	BA, RT(R)	FT Tenure track	14%	RAIT 325, 326, 327, 328
Jennifer Prekeges	MS, CNMT	FT	14%	RAIT 303, 490, 401
John Harley	MD	PT	14%	RAIT 360, 361, 470, 495
Marc LaCrampe	MD	PT	7%	RAIT 340, 341, 410
Eric Taylor	MD	PT	7%	RAIT 365, 350, 370
Michael Hunter	MD	PT	7%	RAIT 371, 415
Maurya Radvilas	R.T.(R)(MR)(CT)	PT	14%	RAIT 301, 302
Mario Ramos	R.T(R)(CT)	PT	14%	RAIT 310, 311
Kelly Yadon	R.T.(R)(IR)	PT	14%	RAIT 320, 321
Michael Coles	R.T.(R)(MR)	PT	14%	RAIT 315, 316
Total Faculty FTE				**1.333**

Administration and Staff			
Name	**Title**	**Responsibilities**	**% Effort in Program**
Ron Radvilas	BAS R&I Chair	Departmental administration and instruction	50%
To be named	Administrative Assistant	Provides administrative support to chair, faculty and students	50%
To be named	Admissions Coordinator	Provides student services assistance to applicants and students	50%
		Total Staff FTE	**1.5**

APPENDIX 1: GENERAL EDUCATION REQUIREMENTS COMPARISON

General Education Area	Competency Areas	BCC Requirement (AAS-DTA degree)	BAS Course Requirement	CWU General Education Requirements	EWU General Education Requirements
Reasoning	Critical Thinking	Must meet all three areas	RAIM 301		
	Quantitative Reasoning		MATH 130	Mathematical Reasoning	Mathematical Reasoning (Pre-calc or elementary prob/stat)
	Research Literacy		ENGL 101	English Composition (1 course)	English Composition (1 course)
Communication	Reading	Writing plus two additional areas		Arts & Humanities (3 courses)	Humanities (2-3 courses)
	Writing		ENGL 201 or 270		
	Listening and Speaking		RAIM 460		
	Visual Communication				
	Computer Literacy		Met by prerequisite		Computer Literacy (2-5 credits or exam)
Responsibility	Self-Assessment	Two areas	RAIM 475		
	Group Processes		RAIM 460		
	Ethics		PHIL 365		
	Lifelong Learning				
Cultural Traditions	Historical/Intellectual Perspectives	Cultural Diversity plus one additional area	GBUS 101 ECON 315	Social & Behavioral Sciences (3 courses)	Social Sciences (2-3 courses)
	Aesthetic Awareness				
	Cultural Diversity		SPCH 330		International Studies (4 credits); Cultural/Gender Diversity (4 credits)
Science & Environment	Nature of Science	Two areas	Met by prerequisite (more than 15 CR)	Natural Sciences (3 courses)	Natural Sciences (2-3 courses)
	Science and Natural World				
	Technology & Society				

APPENDIX 2: SUPPLEMENTAL PLANNING ASSUMPTIONS AND FOUR-YEAR CURRICULUM MAP

ITEM 1: SUPPLEMENTAL PLANNING INFORMATION

BAS Admission Planning Assumptions

1. During first two years of the program, all students will enter the program having completed Math 130 (Statistics), English 201 (Research Paper) or English 270 (Technical Writing), and GBus 101 (Introduction to Business) – total 15 credits.
2. Each of the two concentrations will enroll 50 percent of admitted students.
3. Seventy-five percent of admitted students will have completed one advanced imaging certification (18 credits) upon entry.
4. Approximately 20 percent of admitted students will have completed two advanced imaging certifications (30 credits) upon entry.
5. Students will take an average number of 8 credits per quarter.
6. Forty students per year will be admitted (20 FTE x 45 credits per year / 8 credits per quarter equals 37.5 students).
7. Priority admission for the first year will be given to students who have completed the 15 credits in (1) above and at least one advanced imaging certification. Also, special consideration will be given to work experience and transfer credits.
8. Students may enroll in available seats on a non-matriculated student basis and accumulate up to 18 credit hours that will be applied to their program when admitted.
9. Some additional students may be admitted each quarter, if needed. Admission assumptions will be evaluated quarterly.
10. BCC will reassess the admission process for years 2 and 3, based on the first year's experience.

Case Scenarios for 4 types of students:

1. **RAIT student** admitted having completed 33 credits (15 credits of Math 130, English 201/270, and GBus 101 and one advanced certification 18 credits)

Fall Q1:	Econ 315 – 5 credits	Fall Q2:	RAIM 325 – 5 credits
	RAIT 410 – 3 credits		RAIT 302 – 3 credits
Win Q1:	Speech 330 – 5 credits	Win Q2:	RAIM 460 – 5 credits
	RAIT 401 – 2 credits		RAIM 303 – 3 credits
Spr Q1:	Phil 365 – 5 credits	Spr Q2:	RAIM 340 – 5 credits
	RAIT 490 – 3 credits		RAIM 401 – 5 credits
Sum Q1:	RAIM 301 – 5 credits	Sum Q2:	RAIM 475 – 5 credits

Total credits for year 1 = 28 Total credits for year 2 = 31
Grand total of 92 credits

2. **RAIT student** admitted having completed 45 credits (15 credits of Math 130, English 201/270, and GBus 101 and two advanced certifications 30 credits)

Fall Q1:	Econ 315 – 5 credits	Fall Q2:	RAIM 325 – 5 credits
	RAIT 302 – 3 credits		
Win Q1:	Speech 330 – 5 credits	Win Q2:	RAIM 460 – 5 credits
	RAIT 303 – 3 credits		

Spr Q1:	Phil 365 – 5 credits	Spr Q2:	RAIT 495 – 5 credits
Sum Q1:	RAIM 301 – 5 credits	Sum Q2:	RAIM 475 – 5 credits

Total credits for year 1 = 26 Total credits for year 2 = 20
Grand total of 91 credits

3. **RAIM student** having completed 33 credits (15 credits of Math 130, English 201/270, and GBus 101 and one advanced certification 18 credits)

Fall Q1:	Econ 315 – 5 credits	Fall Q2:	RAIM 401 – 5 credits
	RAIM 325 – 5 credits		RAIM 350 – 5 credits
Win Q1:	Speech 330 – 5 credits	Win Q2:	RAIM 460 – 5 credits
	RAIM 320 – 5 credits		RAIM 440 – 5 credits
Spr Q1:	Phil 365 – 5 credits	Spr Q2:	RAIM 340 – 5 credits
			RAIM 410 – 5 credits
Sum Q1:	RAIM 301 – 5 credits	Sum Q2:	RAIM 475 – 5 credits

Total credits for year 1 = 30 Total credits for year 2 = 35
Grand total of 98 credits

4. **RAIM student** having completed 15 credits (Math 130, English 201/270, and GBus 101)

Fall Q1:	Econ 315 – 5 credits	Fall Q2:	RAIM 401 – 5 credits
	RAIM 325 – 5 credits		RAIM 350 – 5 credits
Win Q1:	Speech 330 – 5 credits	Win Q2:	RAIM 460 – 5 credits
	RAIM 320 – 5 credits		RAIM 440 – 5 credits
Spr Q1:	Phil 365 – 5 credits	Spr Q2:	RAIM 410 – 5 credits
	RAIM 340 – 5 credits		RAIT 495 – 5 credits
Sum Q1:	RAIM 301 – 5 credits		

Total Credits for year 2 = 35 Total credits for year 2 = 30 credits

Fall Q3:	RAIT 301 – 3 credits
	RAIT 302 – 3 credits
Win Q3:	RAIM 475 – 5 credits

Total credits for year 3 = 11
Grand total of 91 credits

Curriculum Planning Assumptions

1. Average class size is 20.
2. Clinical practicum courses and the capstone course will be taught quarterly by the program chair for his 50 percent teaching load.

	Year 1	Year 2	Year 3	Year 4	Year 5
Max FTES	34	58	62	58	62
Total FTEF	1.73	2.96	3.1	2.96	3.1

3. 40 new students will be admitted every year. There will be a 10 percent attrition rate.

	Year 1	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Incoming	40	40	40	40	40
Continuing	0	40	61	60	59
Attrition	0	-4	-6	-6	-6
Total	40	76	95	94	93
Graduates	0	15	35	35	35
Remaining	40	61	60	59	58

ITEM 2: FOUR YEAR CURRICULUM MAP (DRAFT 4/29/06)

	2007-08	Cr	2008-09	Cr	2009-10	Cr	2010-11	Cr
Fall	ECON 313 Economics of Health Care	5	ECON 313 Economics of Health Care	5	ECON 313 Economics of Health Care	5	ECON 313 Economics of Health Care	5
	RAIM 325 Organizational Theory	5	RAIM 325 Organizational Theory	5	RAIT 301 Cross-sectional Anatomy	3	RAIM 325 Organizational Theory	5
	RAIT 301 Cross-sectional Anatomy	3	RAIT 301 Cross-sectional Anatomy	3	RAIM 350 Legal and Regulatory	5	RAIT 301 Cross-sectional Anatomy	3
	RAIT 302 Body Pathophysiology	3	RAIT 302 Body Pathophysiology	3	RAIT 415 Advanced MR Procedures	3	RAIT 302 Body Pathophysiology	3
	RAIT 415 Advanced MR Procedures	3	RAIM 350 Legal and Regulatory	5	RAIM 325 Organizational Theory	5	RAIM 350 Legal and Regulatory	5
			RAIM 401 Marketing	5	RAIT 302 Body Pathophysiology	3	RAIM 401 Marketing	5
			RAIT 304 Oncology	4	RAIM 401 Marketing	5	RAIT 304 Oncology	4
			RAIT 326 Ultrasound Physics for Mammo.	3	RAIT 304 Oncology	4	RAIT 326 Ultrasound Physics for Mammo.	3
			RAIT 350 Nuclear Cardiology	5	RAIT 326 Ultrasound Physics for Mammo.	3	RAIT 350 Nuclear Cardiology	5
					RAIT 350 Nuclear Cardiology	5		
	Total	**19**		**38**		**41**		**38**
Win	RAIM 320 Finance & Accounting	5	RAIM 320 Finance & Accounting	5	RAIM 320 Finance & Accounting	5	RAIM 320 Finance & Accounting	5
	SPEECH 330 Intercultural Communication	5	SPEECH 330 Intercultural Communication	5	RAIT 303 Neuro Pathophysiology	3	SPEECH 330 Intercultural Communication	5
	RAIT 303 Neuro Pathophysiology	3	RAIT 303 Neuro Pathophysiology	3	RAIT 310 CT Instrumentation	3	RAIT 303 Neuro Pathophysiology	3
	RAIT 310 CT Instrumentation	3	RAIT 310 CT Instrumentation	3	RAIM 460 Management and Leadership	5	RAIT 310 CT Instrumentation	3
	RAIT 320 Interventional Procedures	3	RAIT 320 Interventional Procedures	3	RAIT 490 Information and Image Mgmt.	3	RAIT 320 Interventional Procedures	3

			RAIM 460 Management and Leadership	5	RAIM 440 New Business Planning	5	RAIM 460 Management and Leadership	5
			RAIM 440 New Business Planning	5	SPEECH 330 Intercultural Communication	5	RAIM 440 New Business Planning	5
			RAIT 490 Information and Image Management	3	RAIT 320 Interventional Procedures	3	RAIT 490 Information and Image Management	3
			RAIT 327 Breast Ultrasound	3	RAIT 327 Breast Ultrasound	3	RAIT 327 Breast Ultrasound	3
			RAIT 360 Positron Emission Tomography	3	RAIT 360 Positron Emission Tomography	3	RAIT 360 Positron Emission Tomography	3
	Total	**19**		**38**		**38**		**38**
Spr	RAIM 340 Human Resources	5	RAIM 340 Human Resources	5	RAIM 340 Human Resources	5	RAIM 340 Human Resources	5
	RAIT 315 MR Instrumentation	3	RAIT 315 MR Instrumentation	3	RAIT 315 MR Instrumentation	3	RAIT 315 MR Instrumentation	3
	RAIT 325 Mammography	4	RAIT 325 Mammography	4	RAIT 325 Mammography	4	RAIT 325 Mammography	4
	RAIT 410 Advanced CT Procedures	3	RAIT 495 Quality Assurance & Accreditation	5	RAIT 495 Quality Assurance & Accreditation	5	RAIT 495 Quality Assurance & Accreditation	5
	PHIL 365 Bioethics	5	PHIL 365 Bioethics	5	PHIL 365 Bioethics	5	PHIL 365 Bioethics	5
			RAIM 410 Institutional Quality & Safety	5	RAIT 410 Advanced CT Procedures	3	RAIM 410 Institutional Quality & Safety	5
			RAIT 328 Ultrasound Equip. for Mammographers	3	RAIM 410 Institutional Quality & Safety	5	RAIT 328 Ultrasound Equip. for Mammographers	3
					RAIT 328 Ultrasound Equip. for Mammographers	3		
	Total	**20**		**30**		**33**		**30**
Sum	RAIT 301 Essentials of Imaging	5	RAIT 301 Essentials of Imaging	5	RAIT 301 Essentials of Imaging	5	RAIT 301 Essentials of Imaging	5
	Total	**5**		**5**		**5**		**5**

The following courses will be offered all four quarters each year, as needed:

RAIM 475	Capstone	5 credits
RAIT 311	CT Practicum	12 credits
RAIT 316	MRI Practicum	12 credits
AIT 321	Inter Practicum	12 credits
RAIT 361	PET Practicum	12 credits

APPENDIX 3: COURSE DESCRIPTIONS

Radiation and Imaging Management Course Outcomes

RAIM 301 Essentials of Imaging and Therapy 5 cr.
Familiarizes the student with different modalities within the radiology and radiation therapy fields, including terminology, equipment, procedures, safety issues, staffing and economics. Emphasis is on understanding the modality from an administrative standpoint. Students will complete 5 modules in modalities in which they are not certified.

Course Content Outline: this course will be offered as a series of modules, each of which addresses the course outcomes for a particular modality. The student will complete five of the modules, all in areas in which the student is not currently certified. The modules are:

- Radiography
- Radiation therapy
- Computed tomography
- Magnetic resonance imaging
- Interventional radiology
- Nuclear medicine
- Ultrasound
- Mammography

Each module covers the following areas:

- Equipment and associated terminology
- Staffing considerations
- Safety issues
- Costs and revenues in the radiation/imaging unit
- Regulations and accreditations issues

Learning Outcomes:

1. Describe in lay terms the equipment used to create images and/or treat patients in the modality, and employ terminology used within the modality.
2. Analyze staffing considerations as they relate to workload, job satisfaction and performance, and patient care.
3. Examine patient and health care worker safety issues, including not only the imaging/therapy professional but also ancillary workers.
4. Assess costs and sources of revenue and discuss factors that positively and negatively impact them.
5. Interpret regulatory and accreditation issues and discuss how these impact all of the above topics.

RAIM 320 Finance and Accounting for Health Care Managers 5 cr.
Addresses issues of financial management in health care systems, including budget development and analysis, equipment purchase and depreciation, salaries and benefits, and coding and reimbursement. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Trends and current issues in health care finance management and accounting
- Financial environment in the health care industry and in radiation and diagnostic imaging departments
- Basic accounting principles applied to the health care system

- Financial cycle and value chain in the health care business and in radiation and diagnostic imaging departments
- Financial statements and budgets, and financial decision-making process in health care organizations
- Financial assessment and risk in health care and radiation and diagnostic imaging departments
- Regulations and standard practices in health care finances and accounting
- Financial roles of the different health care organizations and departments
- Financial oversights in the health care industry
- Financial planning, documentation, reporting, controls and auditing process
- Financial and accounting software
- Equipment purchase and depreciation accounting as they apply to radiation and diagnostic imaging departments
- Salaries and benefits accounting and evaluation as they apply to radiation and diagnostic imaging departments
- Pricing strategies as they applies to radiation and diagnostic imaging departments
- Medical coding and reimbursement
- Financial ethics
- Financial management of multinational health care organizations and workforce

Learning Outcomes:

1. Present and analyze the trends and current issues in health care finance management and accounting
2. Analyze the financial environment in the health care industry and how it affects the role of health care managers in radiation and diagnostic imaging departments
3. Identify, define and apply basic accounting principles, assumptions and constraints in the context of the health care system and radiation and diagnostic imaging departments
4. Record and summarize economic transactions in accordance with generally accepted accounting principles
5. Analyze the financial cycle and value chain in the health care business and radiation and diagnostic imaging departments
6. Prepare, analyze, and interpret health care financial statements and budgets
7. Develop and justify financial recommendations using accounting data that relates to the financial decision-making process
8. Explain the concepts and elements of budgeting, costs and capital financing, working capital, and financial assessment and risk as they apply to health care and radiation and diagnostic imaging departments
9. Summarize the regulations and standard practices that govern health care finances and accounting
10. Prepare, evaluate and assess general financial and accounting information
11. Examine the financial roles of the different organizations in the health care system, including health care providers, insurances, labs, and patients
12. Discuss and synthesize the trends in financial oversights in the health care industry
13. Analyze the process of financial planning, documentation, reporting, controls and auditing in the context of radiation and diagnostic imaging departments
14. Compare the advantages and limitations of commonly used financial and accounting software products and systems in the health care industry
15. Define and apply practices that support equipment purchase and depreciation accounting, salaries and benefits accounting and evaluation, and pricing strategies in the context of radiation and diagnostic imaging departments
16. Analyze the process and issues relating to medical coding and reimbursement with an emphasis on codes relating to radiation and diagnostic imaging departments
17. Discuss and synthesize ethical standards for the process of financial management and accounting in health care

RAIM 325 Organizational Theory and Behavior in Health Care 5 cr.

Presents theory and practice of organizational design as it applies to health care organizations, including organizational models, matrix management, understanding of reporting relationships, and how organizational design affects group and interpersonal interactions. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Organizational design theory and practice
- Organizational models in health care
- Reporting structure, roles and relationships in health care and radiation and diagnostic imaging organizations
- Trends in health care organizational theories and practices
- Organizational communication in the health care industry and radiation and diagnostic imaging departments
- Organizational change management
- Ethics and personal responsibilities in health care
- Legal issues in organizational design in the health care environment
- Elements of organizational culture
- Health care organization and radiation and diagnostic imaging departments performance and effectiveness
- Fostering flexibility and creativity through organizational design
- Employee motivation, recognition and conflict resolution in radiation and diagnostic imaging departments
- Virtual organization or team in the context of radiation and diagnostic imaging departments

Learning Outcomes:

1. Examine the basic theory, practice and trends in organizational design, and their application to health care and radiation and diagnostic imaging organizations
2. Evaluate different organizational models and identify their positive and negative aspects, and their applicability to health care and radiation and diagnostic imaging organizations
3. Identify and analyze the reporting relationships in a wide range of health care organizational structures
4. Discuss how organizational design affects group and interpersonal interactions
5. Define the various roles, functions, and levels of management in health care and radiation and diagnostic imaging organizations
6. Evaluate communication strategies that support the organizational structure and organizational changes
7. Investigate the issues and practices of ethical behavior and personal responsibilities in the context of health care and radiation and diagnostic imaging organizations
8. Examine the legal issues and constraints relating to organization structure and behavior as they apply to health care and radiation and diagnostic imaging organizations
9. Analyze the elements of organizational culture and how different cultures lead to different employee and organization behavior
10. Examine how organization structure and culture impact individual and organization performance and effectiveness in health care and radiation and diagnostic imaging organizations
11. Explain the elements and discuss the issues of organization leadership
12. Examine different ways flexibility and creativity can be fostered within the context of a given organizational structure

13. Present the basic concepts and strategies of employee motivation, recognition and conflict resolution in health care and radiation and diagnostic imaging organizations
14. Debate the specific challenges of working as a part of a virtual organization or team

RAIM 340 Human Resources Management in the Health Professions 5 cr.

Examines laws, regulations and practices relating to employment in health care settings, including specific requirements for staffing, union relationships, diversity issues, writing job descriptions, and employee evaluations, probation and dismissal. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

1. Employment laws and regulations in health care
2. Human resource management
3. Unions and recruiting, retention and evaluation
4. Immigration and diversity issues in employee recruiting and management
5. Job descriptions and postings for radiation and diagnostic imaging employees
6. Evaluation strategies and instruments
7. Probation and dismissal of employees
8. Union and employment contracts
9. Hiring and interviewing
10. Compensation and benefits
11. Performance appraisals, promotions and terminations
12. Human resource department in the health care organization
13. Role of radiation and diagnostic imaging hiring managers
14. Employee development and training in radiation and diagnostic imaging departments
15. Human resource management issues and trends in the health care and radiation and diagnostic imaging organizations
16. Virtual organizations and teams

Learning Outcomes:

1. Examine the laws and regulations governing employment issues in the health care system
2. Analyze the human resource management issues of health care multinational organizations and workforce
3. Debate the impact of unions on the recruiting, retention and evaluation of employees in a health care setting
4. Examine how immigration and diversity issues relate to the recruiting and management of employees
5. Develop job descriptions and postings for radiation and diagnostic imaging employees that abide to US and state laws and regulations, and follow standard business practices
6. Develop and compare various evaluation strategies and instruments in accord to laws and business practices in the context of radiation and diagnostic imaging departments
7. Analyze issues relating to probation and dismissal of employees, including union contracts, employee contracts and regulations in the context of radiation and diagnostic imaging departments
8. Examine employee issues, practices and regulations that relate to the hiring interview process, compensation and benefits, performance appraisals, promotions and terminations for health care departments
9. Evaluate the role of the human resource department in the health care organization and how it intersects with the role of the radiation and diagnostic imaging hiring manager
10. Analyze various strategies that support employee development and training in radiation and diagnostic imaging departments

11. Examine the human resource management issues and trends in the health care and radiation and diagnostic imaging organizations
12. Debate the specific challenges of employee evaluation in a virtual organization or team

RAIM 350 Legal and Regulatory Considerations in Health Care 5 cr.

Addresses all aspects of laws and regulations pertaining to health care with the exception of staffing and employment issues. Topics include contracts with equipment vendors, HIPAA and Stark laws, and insurance. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Health care laws and regulations
- Equipment and vendor contracts
- HIPAA and Stark laws
- Health care insurance laws and regulations
- Patient rights and responsibilities
- Corporate and personal responsibilities and liability
- Basics of criminal and tort law
- Information management in health care
- Trends in the legal and regulatory environment in the health care system

Learning Outcomes:

1. Present all aspects of laws and regulations pertaining to health care (with the exception of staffing and employment issues) and discuss their implication at the radiation and diagnostic imaging department level
2. Evaluate the role and issues of the certificate-of-need process in controlling health care costs
3. Draft and review contracts with equipment manufacturers and other vendors and assess their compliance with local and federal laws
4. Analyze in detail the HIPAA and Stark laws and evaluate how they impact health care practices
5. Present laws and regulations that relate health care insurance (both corporate and individual), and their implications at the radiation and diagnostic imaging department level
6. Examine issues of patient rights and responsibilities, and corporate responsibilities and liability
7. Present the basic principles and elements of criminal and tort law and analyze health care and radiation and diagnostic imaging case studies
8. Discuss the ethics and the issues surrounding organizational responsibility and liability, and professional responsibility and liability, and analyze health care and radiation and diagnostic imaging case studies
9. Debate constraints, responsibilities and strategies relating to information management in health care
10. Examine the trends in the legal and regulatory environment in the health care system
11. Analyze the legal responsibilities, constraints and potential liabilities relating to partnership relationships

RAIM 401 Marketing in the Health Care Environment 5 cr.

Discusses all aspects of marketing as they are applied in health care, including business-to-business and business-to-consumer aspects. Specific topics include marketing strategies, cost-benefit analysis, and assessment of success of a marketing campaign. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Principles of marketing in health care
- Market research and analysis
- Consumer behavior and market segmentation for health care and radiation and diagnostic imaging organizations
- Environmental scanning and market surveys
- Assessment of new market opportunities for health care and radiation and diagnostic imaging organizations
- Use of information systems in assessing market strategies
- Positioning, pricing and competitive analysis in health care and radiation and diagnostic imaging organizations
- Marketing and business plans
- Service positioning
- Promotion and public relations campaigns
- Ethical and legal issues in marketing and advertising
- Marketing communication for radiation and diagnostic imaging organizations
- Consumer behavior and decision process

Learning Outcomes:

1. Discuss the general elements and principles of marketing as they relate to various health delivery systems
2. Present the basic principles and elements of market research and market analysis
3. Evaluate the advantages and limitations of hiring outside consulting market research organizations
4. Examine the principles of consumer behavior and market segmentation
5. Assess the strategies and tools supporting environmental scanning and market surveys as they apply to health care and radiation and diagnostic imaging organizations
6. Explain the steps and strategies to identify and evaluate new market opportunities for health care and radiation and diagnostic imaging organizations
7. Discuss the basic functions of information systems in assessing market strategies
8. Examine the elements and principles of positioning, pricing and competitive analysis in the context of health care and radiation and diagnostic imaging organizations
9. Develop and evaluate marketing and business plans for health care and radiation and diagnostic imaging organizations
10. Examine the role and elements of a promotion and public relations campaign
11. Debate ethical and legal issues relating to marketing and advertising in health care and radiation and diagnostic imaging organizations
12. Develop marketing communication for a variety of audiences and purposes, and for a range of dissemination formats (newspaper, flyer, electronic…) for radiation and diagnostic imaging organizations
13. Analyze the issues and strategies in repositioning a health care service or product to address different market segments
14. Debate how economic, psychological, and socio-cultural factors affect consumer behavior and the consumer decision process as they relate to health care and radiation and diagnostic imaging organizations

RAIM 410 Institutional and Departmental Accreditation 5 cr.

Prepares the student for all aspects of hospital and departmental accreditation. Includes principles of total quality management, interpretation of accreditation standards, design of processes to address standards, and preparation for a site visit. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments.

Course Content Outline:

- Hospital and departmental accreditation
- Site visits in health care and radiation and diagnostic imaging organizations
- Quality and organizational performance standards
- Health care governing bodies and regulatory standards
- Quality control and assurance strategies
- Standards and outcome development and management in radiation and diagnostic imaging organizations
- Statistical management tools
- Health care providers, vendors and customers role in quality assurance
- Trends in quality management, control and assurance in the health care
- Data collection and analysis, and decision making

Learning Outcomes:

1. Analyze the aspects, issues and elements of hospital and departmental accreditation
2. Identify the steps needed to prepare for a site visit in health care and radiation and diagnostic imaging organizations
3. Discuss the relationship between health care quality and organizational performance standards and management in the context of radiation and diagnostic imaging departments
4. Examine the role of the governing body of the health care organization in ensuring compliance with the standards of regulatory and accreditation organizations
5. Present strategies to establish and maintain a quality environment in health care and radiation and diagnostic imaging organizations
6. Examine the process of standards and outcome development and management in radiation and diagnostic imaging organizations
7. Apply strategies and tools to measure and monitor outcomes, including statistical management tools, in radiation and diagnostic imaging organizations
8. Analyze the role of the various health care providers, vendors and customers in quality assurance
9. Debate the trends in quality management, control and assurance in the health care environment, specifically as they relate to the provision and reimbursement of health care services
10. Select and apply strategies and tools to support data collection and analysis, and decision making that contribute to ongoing total performance management in radiation and diagnostic imaging organizations
11. Evaluate specific tools and strategies to control errors in all aspects of the health care delivery and reimbursement system

RAIM 440 New Business Planning in Health Care 5 cr.

Addresses all aspects of planning and developing a new business venture within the health care arena. Includes plan development, pro-forma budget, estimates of market audience and planning, sources of financing, tracking response/success. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Business plans
- Statement of purpose for new business opportunities in health care and radiation and diagnostic imaging
- Market research
- Business options and scenarios development and analysis
- Operating procedures and resources

- Risk and change management
- Financial information, including loan, capital equipment and supply list, balance sheet, breakeven analysis, pro-forma income projections
- Sources of financing
- New business proposal presentations
- Legal, ethical and conflict-of-interest issues
- Management team selection for radiation and diagnostic imaging organizations
- Communication plan and instruments

Learning Outcomes:

1. Analyze the essential elements of a business plan and define associated terminology
2. Develop statement of purpose for new business opportunity for health care and radiation and diagnostic imaging organizations
3. Evaluate the market research needed to support the business plan and outline process
4. Develop business options and scenarios and compare each for strengths and weaknesses in the context of health care and radiation and diagnostic imaging organizations
5. Outline operating procedures and resources needed to support the new business in radiation and diagnostic imaging
6. Evaluate risk to the existing operations associated with starting the new business in radiation and diagnostic imaging
7. Develop detailed financial information, including loan, capital equipment and supply list, balance sheet, breakeven analysis, pro-forma income projections for radiation and diagnostic imaging organizations
8. Develop detailed documentation of assumptions upon which projections were based
9. Analyze sources of financing and develop recommendations
10. Develop presentation and supporting material to present new business concept to various stakeholders and potential investors
11. Assess legal, ethical and conflict-of-interest issues that may relate to the launching of the new business in radiation and diagnostic imaging
12. Debate key elements in the selection of the management team for radiation and diagnostic imaging organizations
13. Develop communication plan and instruments to inform organization and relevant community

RAIM 460 Management and Leadership in Health Care 5 cr.

Prepares students to assume a leadership role in the health care environment. Topics include relations with staff including remotely located employees, communications skills for managers, time management, motivating employees, and conflict resolution. Case studies are used to bring a contextual focus on radiation and diagnostic imaging departments and the health care industry.

Course Content Outline:

- Trends in team and organization management in health care and radiation and diagnostic imaging organizations
- Virtual teams and remotely located employees
- Communication styles
- Inter-personal and team skills assessment
- Effective management skills in radiation and diagnostic imaging organizations
- Leadership and motivation theories and practices
- Management strategies and their impact on communication, stress, and productivity
- Decision-making processes and techniques
- Globalization and diversity

- Training plans and scenarios
- Effective time management
- Employee reward and motivation
- Conflict resolution
- Change management in health care and radiation and diagnostic imaging organizations

Learning Outcomes:

1. Analyze the trends in team and organization management in the health care industry and radiation and diagnostic imaging departments
2. Debate the issues and management strategies that relate to virtual teams and remotely located employees in the context of radiation and diagnostic imaging departments
3. Evaluate different communication styles and how they impact the team and organization performance and morale
4. Identify and develop strategies to assess inter-personal and team skills
5. Examine the qualities and skills of effective project and department managers in radiation and diagnostic imaging organizations
6. Present and compare different leadership and motivation theories and practices, and analyze their respective effectiveness in the context of radiation and diagnostic imaging organizations
7. Develop effective management strategies that promote communication, minimize stress, and increase productivity, and analyze their effectiveness in the context of radiation and diagnostic imaging organizations
8. Examine and practice decision-making processes and techniques that facilitate effective and efficient change management
9. Assess the impact of globalization and diversity on management and leadership strategies and practices in health care and radiation and diagnostic imaging organizations
10. Develop plan and scenarios to prepare and lead effective training sessions for radiation and diagnostic imaging employees
11. Evaluate strategies and tools to support effective time management
12. Analyze strategies to reward and motivate employees
13. Discuss and exercise strategies to identify conflict and support effective conflict resolution
14. Examine organizational leadership in managing continuous change in the context of health care and radiation and diagnostic imaging organizations

RAIM 475 Capstone Project **5 cr.**

Students have an opportunity to review, integrate and practice the breadth of skills and knowledge they acquire throughout the Radiation and Imaging Sciences Program. Students will select and complete a significant project that draws on actual radiation and imaging science case studies and that involves both management and technology components.

Course Content Outline:

- Project selection and definition
- Project review and acceptance by program faculty
- Project plan, timeline and outcome development
- Research and analysis
- Synthesis and development of findings
- Draft, revision and development of final report
- Review and comments from industry representatives
- Development and delivery of class presentation

Learning Objectives:

1. Integrate skills and knowledge acquired from different courses and experiences
2. Develop and implement a project plan following appropriate methods and tools
3. Present information in an effective format and debate issues with audience using a constructive approach
4. Research information using a range of resources, including literature and periodicals, expert interviews, and existing case studies
5. Assess validity and relevance of information, and analyze in the context of project goals and outcomes
6. Evaluate, develop and apply effective methods to manage project milestones and timelines
7. Develop an effective report and presentation commensurate with the scope and complexity of the project
8. Identify and recruit subject matter experts who will add valuable contribution to the project, and interact with the experts in a professional and efficient manner
9. Examine the relationships between management, operational and technical issues in radiation and imaging technology organizations
10. Demonstrate an in-depth and integrated understanding of the complexity of the issues and processes that apply to radiation and imaging technology organizations through the quality of the project process, findings and presentation

Radiation and Imaging Technology Course Outcomes

RAIT 301 Sectional Anatomy 3 cr.

Course presents normal human anatomy in various planes using CT, MR, interventional, and cardiac catheter images.

Course Content Outline:

- General description of CT and MR images
- Relative positions
- Body sections (sagittal, axial, coronal, oblique)
- Vascular circulation—arteries and veins of the heart, abdomen, extremity, skull
- Normal anatomy of abdomen, head and spine, brain, chest, neck

Learning Outcomes:

1. Identify normal anatomy of structures listed in the content using images from various special imaging modalities
2. Predict the relative location of structures surrounding those presented in images
3. Explain the physiology and circulatory patterns of major organs and structures
4. Differentiate between normal and abnormal anatomy taking into account anatomic variances, and discussing supporting evidence
5. Compare and contrast CT and MR images, including a discussion of their respective roles and effectiveness in diagnostic accuracy for specific cases
6. Analyze and apply the selection process of imaging technology and protocol based on specific cases
7. Debate the level of uncertainties associated with interpreting anatomical images and present strategies on how to handle these uncertainties

RAIT 302 Body Pathophysiology 3 cr.

Course presents pathologies of the abdomen, chest, and neck with physiological implications pertinent to CT, MR, Interventional, and Cardiac Cath imaging modalities.

Course Content Outline:

- Advantages and disadvantages of imaging modalities related to general pathologies of the body
- Pathologies, physiological implications, diagnostic evaluations and interventions of alimentary canal, liver, gall bladder, pancreas, lymph system, adrenal glands/kidneys, urinary system, reproductive system, thyroid, and respiratory system.

Learning Outcomes:

Identify normal physiology of pertinent systems/organs, including a discussion of anatomic variances.

1. Identify and analyze pertinent pathologies with physiological implications, including supporting evidence
2. Describe symptoms of identified pathologies and predict their possible implications on systems presenting symptoms and future complications
3. Analyze imaging modalities of choice for pathologies, and examine strategies for selection of a specific imaging technology and protocol
4. Examine possible interventions performed in an imaging department for identified pathologies, and discuss the respective intended outcomes and possible complications
5. Assess the role of imaging modalities in diagnostic evaluations and interventions for specific pathologies
6. Debate the advantages and limitations of imaging modalities used singly or in combination as they apply to specific pathologies and different body systems
7. Examine strategies to select appropriate imaging modalities and protocols based on the specific pathology and body system
8. Develop imaging protocol recommendations for specific case studies

RAIT 303 Neuropathophysiology 3 cr.

Course presents neurological based pathologies and the related diagnostic/interventional procedures applied in evaluation and treatment of them.

Course Content Outline:

- Neuroimaging applications
- White matter disease
- Primary tumors—pediatric versus adult
- Cerebrovascular disease
- Traumatic neuropathophysiology
- Peripheral nervous system abnormalities
- Pathology of the spine
- Congenital abnormalities

Learning Outcomes:

1. Identify normal physiology of the CNS and PNS and relate normal to abnormal processes of each
2. Analyze the physiology of the most common primary tumors of the head and spine including reasons for the primary location and metastatic possibilities
3. Describe the physiology of related structures such as pituitary, orbits, and IAC—common pathologies and their presenting symptoms
4. Predict presenting symptoms of head and spine trauma and relate them to diagnostic imaging findings
5. Examine the most common pathologies of the neurological system, describing associated symptoms and possible imaging strategies
6. Describe lesions of the CNS including symptoms and diagnostic evaluations

7. Evaluate possible interventions performed in an imaging department as they relate to the neurological system
8. Debate the advantages and limitations of imaging modalities used singly or in combination as they apply to specific pathologies of the neurological system
9. Examine strategies to select appropriate diagnostic and intervention procedures based on the specific pathology

RAIT 310 Computed Tomography Instrumentation and Procedures 3 cr.
Course is designed to provide didactic preparation for the advanced level certification exam in CT scanning. It includes information pertaining to the equipment used, clinical application, specific technique applications, patient care and quality control.

Course Content Outline:
- General description of CT scanner operation
- General discussion of CT scanner development
- Definition, technique, and hardware used in digital imaging processing
- Advantages and limitations of CT scanning
- Data acquisition and image reconstruction principles and considerations
- Image manipulation techniques and image quality control
- CT of the head, neck, and spine—indications, patient prep, contrast, common pathologies
- CT of the body— indications, patient prep, contrast, common pathologies

Learning Outcomes:
1. Present the evolution of CT scanning while using appropriate terminology
2. Present in detail the operation of the CT scanner
3. Examine the approved application of CT scanning to pertinent pathologies
4. Present in detail the manner in which CT acquires data and constructs the image
5. Analyze the advantages of image manipulation and the considerations to maintaining image quality
6. Discuss the indications, patient preparation, contrast settings and common pathologies as they apply to CT scanning of head, neck, spine and specific body parts
7. Examine common protocols used in neuro and body imaging
8. Analyze the elements that relate to quality control in CT scanning procedures
9. Evaluate current research involving CT exams and procedures for the future
10. Develop CT scanning protocol recommendations for specific case studies

RAIT 315 MR Instrumentation and Procedures 3 cr.
Course presents the physics of magnetization, image production, image weighting, pulse responses, scanning procedures, magnet safety, and the role of the technologist.

Course Content Outline:
- Magnetic safety
- Hardware components
- Magnetism, resonance and the production of an MR signal
- Image production
- Image weighting, pulse sequences
- Artifacts
- Image options
- SNR considerations, contrast agents, protocols

Learning Outcomes:

1. Define and apply MR related terminology
2. Analyze patient and health care worker concerns with regard to magnet safety, and discuss strategies to minimize risks
3. Identify MR-related hardware components and describe their function in the production of an MR image
4. Define terms referring to MR signal production, describe relationships, and the technologist role in their control
5. Define and appropriately apply terms related to image weighting, and examine the process of image weighing and its role in image quality
6. Analyze pulse sequences commonly used and their role in the MR process, and describe the circumstances where they are optionally applied
7. Examine artifacts produced, their impact on image quality and processes followed to identify their source
8. Examine considerations, contrast agents and protocols for specific MR applications
9. Debate specialized applications of MR and current research in future applications
10. Develop MR protocol recommendations for specific case studies

RAIT 320 Special Diagnostic and Interventional Procedures 3 cr.

Course provides a survey of special diagnostic and interventional procedures. The technologist role and responsibilities in these procedures is discussed relative to equipment and supplies used, drugs administered and assessing/monitoring of the patient.

Course Content Outline:

- Description of IR suite design
- Image recording systems, design and application
- Automatic injectors—proper operation and applications
- Contrast media—types used and complications
- Ancillary equipment—types and application
- Diagnostic procedures—arterial and venous
- Interventional procedures—anatomy, pathology and procedures
- Other specialized procedures

Learning Outcomes:

1. Describe the elements and function of the interventional suite and examine the role and responsibility of the technologist
2. Identify equipment components used in diagnostic and interventional procedures, and examine the function for each component
3. Analyze commonly used protocols for procedures including both diagnostic and interventional approaches
4. Describe patient monitoring equipment and identify and interpret normal readings for patients undergoing procedures
5. Examine the technologist's role in the care of critical patients
6. Discuss pertinent drugs used and analyze post exam patient care procedures
7. Analyze indications and contraindications for procedures commonly performed
8. Assess commonly diagnosed pathologies and identify those pathologies where intervention is recommended
9. Develop diagnostic and interventional procedure recommendations for specific case studies

RAIT 321 Vascular Interventional Clinical 12 cr.
Course provides the student the opportunity to develop required competencies for advance certification in Interventional Vascular Technology. The course includes 40 hours per week for 11 weeks in an IR department.

Course Content Outline:
Documentation of clinical experience in diagnostic and interventional procedures in neurological, thoracic, genitourinary, gastrointestinal, peripheral, and other specialized studies. Specific exams are identified in the Vascular-Interventional Technology Certification Handbook of the American Registry of Radiologic Technologists.

Learning Outcomes:
At the completion of the course, the student will have proven competence in a minimum of 50% of the required procedures. Competence in a required procedure includes evaluation of a student's ability to:
1. Prepare supplies according to procedures
2. Monitor equipment following procedure protocols
3. Evaluate and interpret requisitions, and develop appropriate protocol to respond to physician's order
4. Prepare the patient for procedure, both physically and mentally
5. Administer medications as directed
6. Perform patient assessment and monitoring before, during and after the procedure
7. Examine the elements of and accomplish follow-up patient care
8. Process and evaluate images, and develop recommendations for procedure adjustment based on image quality
9. Identify anatomy based on image interpretation
10. Set radiographic technique based on specific conditions
11. Identify and label images created according to accepted practices
12. Analyze ethical issues relating to radiographic procedures and demonstrate ethical behavior and attitude in the clinical setting
13. Demonstrate effective communication skills with patients and co-workers
14. Assess the indications and contradictions for given vascular-interventional procedures based on specific case studies

RAIT 326 Ultrasound Physics for Mammographers 3 cr.
Covers acoustical physics, including the concepts and principles of sound transmission, and the utilization of high frequency sound to produce images for diagnostic purposes.

Course Content Outline:
- Elementary Principles
- Propagation of Ultrasound through Tissues
- Ultrasound Transducers
- Pulse Echo Instruments
- Principles of Pulse Echo Imaging
- Image Storage and Display
- Hemodynamics, Doppler, Color Flow, and Color Power Imaging
- Image Features and Artifacts
- Quality Assurance of Ultrasound Instruments
- Bioeffects and Safety

Learning Outcomes:

1. Identify, contrast, and compare the various types of mechanical waves and the sound spectrum
2. Calculate frequency, wavelength, intensity, and identify relative sizes of objects
3. Anticipate and evaluate reflection characteristics based on acoustic impedance calculations
4. Discuss and note the differences between specular, diffuse, and Rayleigh scatterers
5. Calculate levels of attenuation in tissue
6. Describe and discuss the operational characteristics of an ultrasound transducer
7. Describe, discuss, contrast, and compare the concepts of an array of elements and beam formation
8. Apply the concepts of resolution and focusing to obtain the optimum image; evaluate the image for quality
9. Calculate the range in a pulse-echo event
10. Describe, discuss, contrast, compare, and identify the Doppler effect in a spectral display
11. Identify and evaluate image artifacts and explain them using reasonable physical principles
12. Develop an appreciation for the importance of physics in understanding and using ultrasound techniques

RAIT 327 Breast Ultrasound for Mammographers 3 cr.

Reviews anatomy and physiology of the breast. Includes orientation to cross-sectional imaging of the breast, correlation with mammographic images, and characterization of normal and abnormal findings from a sonographic viewpoint.

Course Content Outline:

- Embryology and Normal Anatomy of the Breast
- Female Physiology: How it Affects the Breast
- Benign versus Malignant Features
- Benign Masses
- Malignant Masses/Staging
- The Male Breast
- The Surgically Altered Breast
- Complementary Imaging
- Case Presentations
- Non-surgical Breast Biopsy

Learning Outcomes:

1. Summarize the embryonic development of the breast
2. Describe the changes in a woman's breast due to age, parity, hormone replacement, and the normal physiologic cycle
3. Contrast the differences in the sonographic appearance of malignant and benign masses in both the male and female breast
4. Identify image artifacts that aid and hinder diagnosis of the breast mass
5. Assess impact of surgical alteration on design of procedure and diagnostic accuracy
6. Demonstrate (in hands-on lab) techniques for breast biopsy to include: localizing the needle, scan technique, sterile procedure, and physician coaching
7. Discuss how the different imaging modalities complement each other in diagnosis of breast disease
8. Develop imaging procedures based on specific conditions

RAIT 328 Ultrasound Equipment for Mammographers 3 cr.

Includes detailed descriptions of essential parts of the ultrasound system using a variety of ultrasound machines, classroom demonstrations of system operations and technique, and some practice on the systems.

Course Content Outline:

- General description of CT (Computed Tomography) and MR (Magnetic Resonance) images
- Relative anatomical positions
- Body sections (sagittal, axial, coronal, oblique)
- Vascular circulation—arteries and veins of the heart, abdomen, extremity, skull
- Normal anatomy of abdomen, head and spine, brain, chest, neck

Learning Outcomes:

1. Identify normal anatomy of structures listed in the content using images from various special imaging modalities
2. Predict the relative location of structures surrounding those presented in images
3. Explain the physiology and circulatory patterns of major organs and structures
4. Differentiate between normal and abnormal anatomy taking into account anatomic variances, and discussing supporting evidence
5. Compare and contrast CT (Computed Tomography) and MR (Magnetic Resonance) images, including a discussion of their respective roles and effectiveness in diagnostic accuracy for specific cases
6. Analyze and apply the selection process of imaging technology and protocol based on specific cases
7. Debate the level of uncertainties associated with interpreting anatomical images and present strategies on how to handle these uncertainties

RAIT 401 Advanced Sectional Anatomy 3 cr.

Course is designed for students having completed a cross-sectional anatomy course. Neuro and vascular anatomy, and sectional images of joint and extremity body areas will be presented with CT and MRI images.

Course Content Outline:

- Anatomy of the arteries and veins of the head, neck, mediastinum, abdomen and extremities
- Anatomy of the central nervous system including all cranial, spinal, orbital and auditory nerves
- Anatomy of the peripheral nervous system
- Anatomy of all extremities and joints

Learning Outcomes:

1. Identify related anatomy on CT and MR images in all planes as they relate to neuro and vascular anatomy, and body joints and extremities
2. Predict the relative location of structures surrounding the identified anatomy
3. Where appropriate, diagram anatomical structures
4. Differentiate between normal and abnormal anatomy taking into account anatomic variances, and discussing supporting evidence
5. Compare and contrast CT and MR images, including a discussion of their respective roles and effectiveness in diagnostic accuracy for specific cases
6. Analyze and apply the selection process of imaging technology and protocol based on specific cases
7. Debate the level of uncertainties associated with interpreting anatomical images and present strategies on how to handle these uncertainties

RAIT 410 Advanced CT Procedures 3 cr.

This course presents state of the art CT technology and the procedures facilitated by this technology.

Course Content Outline:

- Multidetector technology
- Workstation features by manufacturer
- Contrast reactions and medications
- Contrast and non-contrast thorax procedures
- Contrast and non-contrast abdominal procedures
- Contrast and non-contrast neurological procedures
- Contrast and non-contrast extremity procedures
- Pediatric procedures

Learning Outcomes:

1. Compare and contrast single detector and multidetector technology, and discuss respective applications, advantages and limitations
2. Evaluate critical measurements of renal function relative to risk-benefit of renal function contrast exams
3. Analyze possible contrast reactions, equipment needed for treatment, and interventional procedures utilized
4. Create protocols for exams of the thorax, abdomen, and extremities using a 3d workstation, and analyze supporting decisions
5. Evaluate single detector protocols for neuro exams and create protocols for a multidetector 3d workstation
6. Examine pediatric exams that utilize multidetector 3d work stations and evaluate patient safety concerns

RAIT 415 Advanced MRI Procedures 3 cr.

Designed for technologists currently employed as MR technologists and/or those having completed a formal MR instrumentation course. In addition to a brief review of MR physics, this course provides an in-depth analysis of fast imaging pulse sequences, advanced clinical application, advanced hardware, and review current research activity in continued application of Magnetic Resonance Imaging.

Course Content Outline:

- MR image formation principles, K space trajectories, and sampling strategies
- Indications for and application of advanced clinical imaging technologies in angiography, heart, and cardiac imaging
- Automatic injectors—proper operation and applications
- Specialized hardware components of leading edge MRI systems
- Fast imaging techniques using advanced reconstruction algorithms

Learning Outcomes:

1. Present and evaluate advances in techniques that allow for fast scanning, EPI diffusion, and other functional imaging
2. Describe time of flight and phase contrast, and assess enhancing techniques used in angiography
3. Analyze considerations for patient set-up of breast imaging including implants, biopsy, cancer staging
4. Discuss the proper operation and applications of automatic injectors
5. Assess specialized hardware components of leading edge MRI systems
6. Identify anatomy, list clinical indications, describe patient set-up (including lead placement and EKG signal) and explain the reasons for sequences in cardiac imaging
7. Evaluate and discuss new clinical applications of MR

AIT 495 Quality Assurance 5 cr.

Emphasizes the principles and practice of quality assurance as they apply to the medical setting, and in particular to radiology and radiation therapy departments. As a part of the course, students will design a project related to quality assurance that will put these principles into action.

Course Content Outline:

- Quality assurance vs. quality control
- Principles of instrument quality control (e.g., consistency, benchmarking, action levels)
- Principles of departmental quality assurance
- Systems approach to quality assurance (i.e., consideration of QA issues from the beginning to the end of a task or patient study)
- QA evaluation: tools, approaches and solutions
- Compliance with regulations (state/federal law, health department, etc.)
- JCAHO accreditation
- External departmental accreditation (American College of Radiology, Intersocietal Commissions, etc.)
- Total quality management theories and tools
- Quality assurance project

Learning Outcomes:

1. Compare and contrast the key elements of instrumental quality control and departmental or institutional quality assurance
2. Discuss principles and applications of instrument quality control, including acceptance testing, benchmarking, longitudinal evaluation, action levels, etc
3. Examine principles and components of departmental/institutional quality assurance, including patient satisfaction, outcomes assessment, and procedural performance evaluation
4. Evaluate and illustrate the use of a systems approach to quality assurance, using a radiology or radiation therapy department in a hospital as an example
5. Evaluate and apply various approaches and tools for quality assurance evaluation, identify deficiencies, and analyze solutions
6. Synthesize the regulations that apply to hospitals, radiology/radiation therapy departments, and stand-alone imaging centers, and the impact of compliance and non-compliance
7. Assess the role and importance of JCAHO and external accrediting bodies in the evaluation of departmental/institutional excellence
8. Outline key steps in preparing a radiology or radiation therapy department for an accreditation self-study and site visit
9. Analyze theories and mechanisms used for workplace performance improvement such as TQM, six sigma and kaizen, and evaluate their applicability to hospitals in general and to radiology/radiation therapy departments in particular
10. Develop a quality assurance program and a plan for its implementation in an area of the student's specialty

APPENDIX 4: CLINICAL SITES

Clinical Sites for Bellevue Community College Radiologic Technology, Diagnostic Ultrasound, Radiation Therapy and Nuclear Medicine Programs

Radiologic Technology

Evergreen Hospital	Kirkland Wa
Group Health (Eastside)	Redmond Wa
Harborview Hospital	Seattle Wa
Overlake Hospital	Bellevue Wa
Swedish Hospital	Seattle Wa
Swedish/Ballard Hospital	Seattle Wa
University Of Washington Hospital	Seattle Wa
Veterans Administration Hospital	Seattle Wa
Virginia Mason Hospital	Seattle Wa

Diagnostic Ultrasound

Cardiac Study Center	Tacoma Wa
Cascade Valley Hosp./Arlington	Arlington Wa
Deaconess Medical Center	Spokane Wa
Echo Vision	Portland Or
Emanuel Legacy Hospital	Portland Or
Everett Clinic	Everett Wa
Evergreen Hospital	Kirkland Wa
Good Samaritan Hospital	Puyallup Wa
Group Health Coop. - Eastside	Redmond Wa
Harborview Medical Center	Seattle Wa
Harrison Memorial Hospital	Bremerton Wa
Heartsounds Inc/Southwest	Vancouver Wa
Heartsounds/Good Samaritan	Portland Or
Highline Hospital	Burien Wa
Inland Imaging	Spokane Wa
Island Radiology/Nuc Med.	Coupeville Wa
Madigan Army Hospital	Tacoma Wa
Mary Bridge Children's Hospital	Tacoma Wa
Medical Park In Covington	Covington Wa
Northwest Hospital	Seattle Wa
Northwest Radiology/Olympia	Olympia Wa
Overlake Hospital	Bellevue Wa
Pacific Northwest Cardiology	Mount Vernon Wa
Providence Gen Med Ctr	Everett Wa
Providence Hospital	Anchorage Ak
Providence St. Peter/Olympia	Olympia Wa
Providence Swedish Hospital	Seattle Wa
Sacred Heart/Oregon Heart Ctr	Eugene Or
Seattle Nuclear Med- Ultrasound	Seattle Wa
Skagit Valley Hospital	Mount Vernon Wa
South South Radiology	Olympia Wa
Southwest Med. Ctr. /Vancouver	Vancouver Wa
St. Clare Hospital	Tacoma Wa

St. Francis/Federal Way	Federal Way Wa
St. Joseph Med Ctr	Tacoma Wa
St. Joseph's Hospital/Tacoma	Tacoma Wa
Steven's Mem. Hosp/Edmonds	Edmonds Wa
Swedish Hospital	Seattle Wa
Tacoma General Hospital	Tacoma Wa
Univ Of Wa Med Center	Seattle Wa
Va Medical Center	Seattle Wa
Valley Medical Center	Renton Wa
Vancouver Clinic	Vancouver Wa
Yakima Heart Center	Yakima Wa

Radiation Therapy:

Evergreen Radiation Oncology	Kirkland Wa
Group Health Cooperative	Seattle Wa
Multicare Radiation Oncology	Tacoma WA
Overlake Hospital Cancer Center	Bellevue WA
Providence Everett Med. Center	Everett Wa
Seattle Cancer Institute at Northwest	Seattle Wa
Seattle Cancer Care Alliance	Seattle Wa
Swedish Cancer Institute	Seattle Wa
Swedish Cancer Institute At Stevens	Edmonds Wa
Tacoma Radiation Center	Tacoma Wa
University Cancer Center	Seattle Wa
Virginia Mason Radiation Oncology	Seattle Wa
Western Wa Cancer Center	Olympia WA

Nuclear Medicine Clinical Sites

Bellevue Cardiology	Bellevue WA
Cardinal Health	Seattle WA
Cardinal Health	Fife WA
Childrens Hospital And Regional Medical Center	Seattle WA
Group Health Eastside Hospital	Redmond WA
Harborview Medical Center	Seattle WA
Overlake Hospital	Bellevue WA
Overlake Internal Medicine	Bellevue WA
Puget Sound Pet Imaging	Mountlake Terrace WA
Seattle Nuclear Medicine	Seattle WA
St. Joseph Medical Center	Tacoma WA
Swedish Medical Center	Seattle WA
Virginia Mason Medical Center	Seattle WA

APPENDIX 5: BIOGRAPHIES OF OUTSIDE REVIEWERS

Duane Akroyd
Cell phone – (919) 630-6314

Professor and Director of Graduate Programs
Department of Adult and Community College Education
College of Education
North Carolina State University

EDUCATION

School	Program	Degree	Date
Southern Illinois University Carbondale, Illinois	Concentration: Occupational Education Emphasis: Higher Education	Ph.D.	12/86
Florida State University Tallahassee, Florida	Higher Education Administration	Course work toward Ph.D.	82-83
State University of New York at Buffalo Buffalo, New York	Health Science Education	M.S.	8/74
Medical College of Georgia Augusta, Georgia	Radiologic Science	B.S.	6/70
Broome Community College Binghamton, N.Y.	Radiologic Technology	A.S.	8/68
Chenango Valley High School Binghamton, New York	College Preparation Track	Regents' Diploma	6/66

PROFESSIONAL EXPERIENCE

2004- present
Professor and Director of Graduate Programs, Department of Adult and Community College Education, North Carolina State University, Raleigh, N.C.

2002-2004
Associate Professor and Director of Graduate Programs, Department of Adult and Community College Education, North Carolina State University, Raleigh, N.C.

1990-2002
Associate Professor and Coordinator, Health Professions Education, Department of Adult and Community College Education, College of Education, North Carolina State University, Raleigh, N.C.

1986 - 1990
Associate Professor and Chair - Division of Medical Imaging and Therapy, School of Health Related Professions, the University of Alabama at Birmingham.

1984 - 1986
Assistant Professor – Department of Radiologic Technology, School of Applied Sciences and Arts, Division of Allied Health and Public Service, Southern Illinois University, Carbondale, Illinois.

1982 - 1983
Health Policy Analyst Assistant - Florida Postsecondary Educational Planning Commission, Department of Education, Tallahassee, Florida (graduate assistantship).

1976 - 1982
Associate Professor and Chair Department of Radiologic Science, College of Health Science, Boise State University, Boise, Idaho.

1974 - 1976
Associate Professor and Director - Radiologic Technology, Bunker Hill Community College, Charlestown, Massachusetts.

1971 - 1973
Instructor - Department of Oral Medicine, Dental Radiology Section, Medical College of Georgia, Augusta, Georgia.

Richard R. Carlton

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EDUCATION

doctoral coursework	8-98 to present	Arkansas State University Jonesboro, Arkansas major: Educational Leadership Higher Education
doctoral coursework	10-91 to 12-95	The University of Toledo Toledo, Ohio major: Higher Education minor: Education Technology
M.S.	10-82 to 6-91	National Louis University Evanston, Illinois major: Human Resource Development
undergraduate elective coursework	12-77 to 5-81	Columbia College Chicago, Illinois major: Photography
B.S.	9-76 to 6-78	The Finch University of Health Sciences/The Chicago Medical School Gurnee, Illinois major: Radiological Sciences Education & Administration
A.A.S. A.A.	6-74 to 8-75 6-68 to 12-70	Illinois Central College East Peoria, Illinois majors: AAS Radiologic Technology AA Liberal Arts

CERTIFICATION

Registered Technologist, Radiographer, American Registry of Radiologic Technologists, 1-1-76, #122058

Registered Technologist, Cardiovascular-Interventional Technology, American Registry of Radiologic Technologists, 10-17-91, #122058

State of Arkansas, Department of Health, Unrestricted Radiographer License
Licenses previously held but not currently in effect:
State of California Department of Health Services Certified Radiologic Technologist Certificate
State of Ohio Department of Health Radiography License
State of Illinois Department of Nuclear Safety Radiography License

Director and Associate Professor of Radiologic and Imaging Sciences	8-03 to present	Grand Valley State University Radiologic and Imaging Sciences Grand Rapids, Michigan
Assistant Professor of Radiologic Sciences (tenured)	7-97 to 7-03	Arkansas State University Department of Radiologic Sciences State University, Arkansas
Instructor (part time)	10-97 to 5-98	Methodist Hospitals of Memphis School of Radiologic Technology Memphis, Tennessee
Instructor (part time)	8-96 to 5-97	Mills Peninsula Hospitals School of Radiologic Technology Burlingame, California
Director of Diagnostic Medical Imaging	1-96 to 3-97	City College of San Francisco Diagnostic Medical Imaging Dept San Francisco, California
Chairman and Associate Professor of Radiography	3-86 to 1-96	Lima Technical College Radiography Department Lima, Ohio
Assistant Professor (tenured) Clinical Coordinator	7-79 to 2-86	Wilbur Wright College (St. Mary of Nazareth Program) Program in Radiography Chicago, Illinois
Adjunct Instructor (part time)	3-84 to 5-85	National Louis University Radiation Therapy Program and Allied Health Education Program Evanston and Chicago, Illinois
Radiographer (part time)	1-82 to 2-86	Lutheran General Hospital Department of Radiology Park Ridge, Illinois
Instructor (part time)	8-81 to 8-85	Indiana University Northwest Radiography Program Gary, Indiana
Instructor (part time)	1-82 to 5-82	Malcolm X College Radiography Program Chicago, Illinois
Clinical Instructor	7-78 to 7-79	Louis A. Weiss Memorial Hospital School of Radiologic Technology Chicago, Illinois
Radiographer	8-75 to 4-78	Lutheran General Hospital Department of Radiology Park Ridge, Illinois